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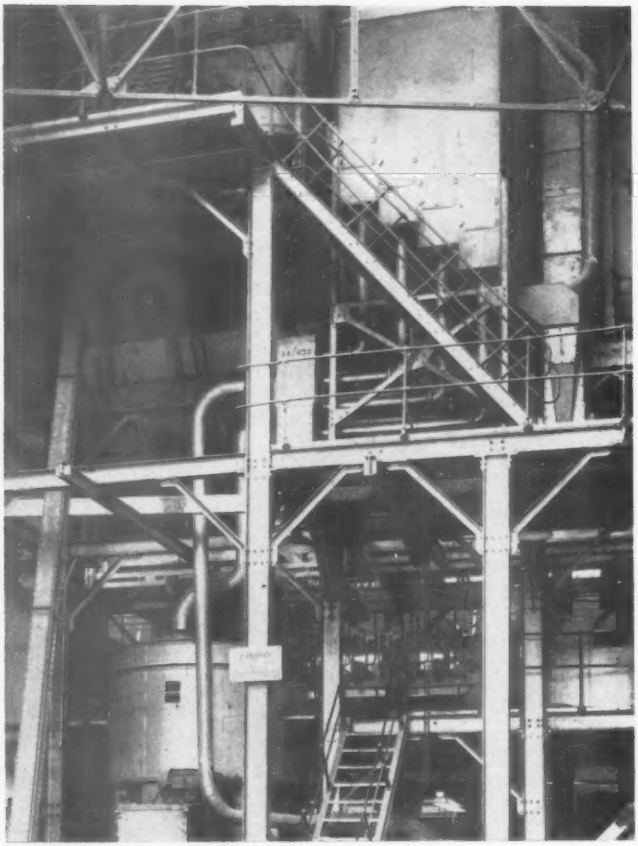
Another Large Steel Foundry using August's LIMITED PLANT



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FOUNDRY
TRADE JOURNAL
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To Buy or Make?

Two-hundred-and-fifty years ago, Abraham Darby mined his own coal and iron ore, made pig-iron, quarried his own sand, and made his own plant and patterns to produce iron castings. Over the years, the majority of iron-founders have gradually reduced these activities and concentrated upon the economic production of castings. The reason for this change is the simple fact that even the most elementary system of costing showed that they could buy from specialized producers cheaper than they could mine, quarry, or manufacture machinery.

There is left, however, the problem of patternmaking. Here, the situation is complicated by convenience, for obviously small alterations and repairs can be made more easily in an attached shop than by using the services of a master patternmaker. This feature apart, we are convinced that in many cases, it costs more to make patterns in an attached shop than to buy them. Already, this fact has been recognized in America, where in general, recourse is had to specialist patternmaking firms and in that country a very important business has grown up for servicing the foundries. In the UK, also, a parallel development is rapidly taking place and we estimate that since the war between £750,000 and £1,000,000 has been spent by the master patternmakers in the equipment of their shops with the latest labour-aiding plant.

In recent years, a number of master patternmakers have individually visited America, whilst collectively, they have inspected the major patternshops of Paris and Germany. They have enlarged their scope so that now they can supply the foundries with pressure-cast patternplates or resin patterns. A recently-issued series of graphs shows that the ironfounding industry has been operating at a lower margin of profit than others—a distinctly unhealthy situation. Thus, we counsel foundry executives carefully to ascertain their overall patternshop costs and those for individual jobs and compare them with quotations submitted by master patternmakers. As the major cost of a pattern is labour, the net can be spread fairly wide, for transport is not such an important factor.

Stanton's Ore-preparation Plant

Last week saw the official opening by Mr. F. le Neve Foster, a director of Stewarts and Lloyds, Limited, of the new £4,000,000 ore-preparation plant of the Stanton Ironworks Company, Limited, at Ilkeston (Derbys). The plant is designed to process between 25,000 and 30,000 tons of ore per week, and it is expected to enable the company to improve the efficiency of the blast furnaces at the site, increase the output of pig-iron, and allow large reserves of home ore which are at present unsuitable without preparation, to be used. In its essence, the new plant comprises three sections, for: (*a*) primary and secondary crushing and grading of incoming ore; (*b*) ore stocking and blending of these stocks by the layering method, and (*c*) the sintering of ore fines with the addition of coke breeze and selected imported ore. The site covers 40 acres, more than six miles of conveyor belting is in use and there are sidings for 700 wagons. Altogether, about 150 men are at present employed, including electrical and maintenance staff. A particular feature is made of full instrumentation and regulation of cyclic operational sequences.

Present and Future Possibilities

Discussing the new plant at a meeting with representatives of the Technical Press on the day before the actual opening ceremony, Mr. N. C. Macdiarmid, managing director, explained the reasons which had led Stanton to instal this quite expensive equipment. Up to the present, he said, it had been possible to continue the traditional ironmaking method at Stanton largely with home-produced ores, but, now, home-ore quality was such that this could no longer be done, especially with the increased requirements within the UK foundry industry for irons with lower phosphorus contents. With the new plant, it was hoped to continue with home-produced ores, to reduce coke consumption in the blast furnace, and possibly to lower the cost of iron produced and hence, ultimately, its selling price.

In addition, the use of sinter ore would give iron of greater consistency of composition and might ultimately offer the possibility of taking hot metal from the blast furnace direct to suitable applications within the Stanton foundries—but here there was much need for research.

Answering questions, Stanton executives present explained that while 2½ to 3½ cwt. of coke per ton of iron produced in the blast furnace might be saved by using sinter, some extra coke (in the form of hitherto surplus coke breeze) was used in the sintering plant. The net saving to be realized at a 40 per cent. sinter utilization in the blast-furnace charge might be of the order of 1 to 1½ cwt. of coke per ton of iron.

The primary design of the new plant was the work of Stanton engineers, co-opting the services of their main contractors for subsidiary features; the site permitted space for a total of three sintering plants. Sintering reduced the firm's reliance on certain types of imported ore and permitted the inclusion of powdered ore from abroad in the ore blend. Furthermore, by increasing the amount of imported ore in the sinter, it would be possible to programme one or other of the company's blast furnaces to produce any iron compositions between 0.7 and 1.4 per cent. phosphorus. On the primary ironmaking plant at Stanton, already of basically modern design, approximately £10,000,000 had been spent in improvements since the war, it was stated. A concluding remark was that to get full efficiency from the plant as a whole it would be necessary to operate it at near full capacity—a prerequisite being increased sales of pig-iron to founders.

Forthcoming Events

OCTOBER 12

Institution of Production Engineers

Presentation of the E. W. Hancock paper "Human Relations in Industry," by R. A. Banks, 6.30 p.m., in the Large Lecture Theatre, Engineering Faculty, University of Bristol. (Meeting open to non-members, but admission by ticket only, available from the secretary of the Institution, 10 Chesterfield Street, London, W.1.)

OCTOBER 13

Institution of Production Engineers

London graduate section: "Properties and Application of Modern Precision Grinding Wheels," by J. Manning, 7.15 p.m., at 10, Chesterfield Street, Mayfair, London, W.1.

Institute of British Foundrymen

Coventry section: Presidential address, followed by "Development of Cast Metals," by H. T. Angus, Ph.D., M.Sc., 7.30 p.m., at Coventry Technical College, Room A5.

Combustion Engineering Association

Northern region: Brains Trust on "Furnace Operation," 10.30 a.m., at the Grand Hotel, Sheffield.

OCTOBER 14

Institution of Plant Engineers

East Midlands branch: "Jodrell Bank Radio Telescope," by C. N. Kington, 7 p.m., in the Sherwood Rooms, County Hotel, Theatre Square, Nottingham.

OCTOBER 15

Institution of Plant Engineers

Blackburn branch: "Operational Research in the Steel Industry," by G. D. Jordan, 7.30 p.m., at the Castle Hotel, Blackburn.

Glasgow branch: "The Engineer's Approach to Non-destructive Testing of Metals," by H. Potter, 7.15 p.m., at the Scottish Building Centre, 425/427, Sauchiehall Street.

Iron and Steel Institute

Joint meeting with the Corrosion group of the Society of Chemical Industry for discussion of the sixth report of the Corrosion Committee (published recently as No. 66 in the Special Report series of the ISI). Sections covering atmospheric corrosion, protective coatings, and marine corrosion will be dealt with. 2 p.m. at 14, Belgrave Square, London, S.W.1, admission by ticket only, available from the secretary, ISI, at the address quoted.

Institute of British Foundrymen

Beds & Herts section: Presidential evening at W. H. Allen Sons & Company, Limited, Bedford, 7.30 p.m.

Institute of Vitreous Enamellers

Northern section: "Spray-painting Methods," lecture and film by a member of the Aerograph Devilbiss Company, Limited, 7.30 p.m., Old Nags Head, Deansgate, Manchester.

Midland section: "Chemical-resistance of Enamels on Domestic Equipment," by N. S. C. Millar, 7.30 p.m., at the Birmingham Exchange and Engineering Centre.

Aluminium/Zinc Castings Exhibition

Last week, Main Metal (Great Britain), Limited, at their new offices at Bridge House, 181, Queen Victoria Street, London, E.C.4, staged an exhibition of sand and die-castings—including bearings made from Main Metal. Ingots of this aluminium/zinc-base alloy are now made for the proprietors by International Alloys, Limited. The alloy has a fairly long freezing-range and the exhibits showed clearly that where proper feeding and running conditions were applied this lightweight alloy gives excellent results. The co-operative exhibition included some excellent examples of the founder's art from many well-known makers of castings.

Instruments, Electronics and Automation Exhibition

The International Instruments, Electronics and Automation Exhibition, which is organized by Industrial Exhibitions, Limited, 9, Argyll Street, London, W.1, is to be held at Olympia, London, in May, 1960. More than 450 firms will be participating and of these at least 100 will come from overseas. It is reported that there is already a waiting list of exhibitors.

British Steel Castings Research Association

The following extracts from the BSCRA sixth annual report commence with a summary of the general set-up of the Association, its committees and membership. The section on research is then dealt with *in extenso*, under the headings: steelmaking; foundry processes and materials; metallurgy; plant engineering, and industrial health.

The following article has been taken from the recently-issued report of the British Steel Castings Research Association, covering the Association's activities up to March 31, 1959.

GENERAL

The year ending March 31, 1959, was the final year of the first quinquennium of grant aid from the Department of Scientific and Industrial Research, the Association having operated under its present title for twelve months before seeking financial support from the Department. The Council has therefore been heavily engaged in reviewing the Association's activities and planning its future development for the purpose of submitting its case for the renewal of grant. The difficulty of this undertaking has been heightened by the fall in the level of trade that has been continuous since the end of 1957, and which will be reflected in the income of the Association in the years 1959-60 and 1960-61. The Council reports that the grant for the quinquennium 1959-64, while greater in amount, is, in accordance with DSIR policy, proportionately less in relation to industrial income. The Council has accepted the terms of grant with satisfaction, and they will enable the Association to finance a substantial proportion of the much needed expansion of activities and premises that had been envisaged.

Council

Dr. R. Hunter has accepted an invitation to become the vice-chairman of the Council, with a view to being elected chairman after the annual general meeting in 1959. It has been further decided that with the firm establishment of the Association and its administration, it is now possible to contemplate a regular change in the chairmanship of the Council, and it is intended that future holders of the office shall each serve for a term of two years.

During the year, Mr. G. M. Menzies retired from the Council on completion of his term of office as chairman of the British Steel Founders' Association; and Mr. M. C. Lloyd was co-opted to fill the casual vacancy caused by the retirement of Mr. A. B. Lloyd on leaving the industry. Mr. Lloyd will retire at the annual general meeting in 1959 in accordance with Article 30. At the same meeting four members will retire in accordance with Article 28, namely Dr. Gregory, Mr. Kain, Mr. Scott and Mr. Rowe.

Mr. F. N. Lloyd, whose term of office as a member of Council also expires this year, is prevented by other commitments from standing for re-election. Mr. Lloyd has been a member of the Council since the inception of the research organization, and was its chairman until December, 1953; and it is therefore with very great regret that the Council has accepted his decision to retire from office.

Committees of the Council

At the close of the last financial year, Mr. F. W. Rowe tendered his resignation from the chairmanship of the finance committee, an office which he had filled most ably since the first appointment of the committee in 1953. The Council regretfully accepted this resignation, and report that Sir William Scott accepted the chair of this committee, which was strengthened by the election of Mr. A. H. Catton and Mr. J. Currie.

The research committee, with Dr. Gregory in the chair, has continued to maintain oversight of the progress of research and to advise the Council on future requirements as regards staff, equipment and accommodation, as well as upon changes in the content and emphasis of the programme of research. Two additions have been made to the membership of the committee, Dr. P. A. Young (Head Wrightson & Company, Limited) and Dr. V. Kondic (department of industrial metallurgy, Birmingham University) having been appointed.

The renewal of application for DSIR grant aid has thrown additional work and responsibility upon both the research and the finance committee, and the Council takes this opportunity to record its appreciation of the support which these committees, and particularly their chairmen, have given to the Association.

Technical Advisory Committee

The function of the five technical advisory committees is to assist the director by advising him on the progress of research projects and to form a link between the industry and the research staff, thus helping to ensure that research projects are adequately related to industrial requirements and that the results of research are interpreted to industry in easily assimilated forms. Those members of the committee who are drawn from member companies are appointed by the director himself, consulting with the committee chairmen, for a period of three years; a small number of other

specialists from outside the industry are also invited to serve on some of the committees.

A major review of the membership of the committees was undertaken in the autumn of 1957, and changes which became effective during 1958-59 were as follow:

Foundry Practice Committee: Mr. F. Cousans (Hadfields, Limited) succeeded Mr. A. B. Lloyd as chairman, and Mr. R. A. Duff (Parker Foundry (1929), Limited) was appointed an additional member.

Moulding Materials Committee: Mr. H. L. Carey (Vickers-Armstrongs (Engineers), Limited), Mr. R. S. Pratt (Wm. Cook & Sons (Sheffield), Limited), Mr. R. Savage (E. Jopling & Sons, Limited), Mr. J. K. Wallett (F. H. Lloyd & Company, Limited), and Mr. R. Wright (English Steel Castings Corporation, Limited), joined the committee. The retirement of Mr. A. E. Scrayfield from English Steel Castings Corporation, Limited, resulted in his retirement also from the committee, and the occasion was marked at a luncheon on April 1, 1958, when the committee chairman, Mr. A. C. Brearley, made a presentation to Mr. Scrayfield on behalf of the committee in recognition of his many pioneering achievements in the development and application of steelfoundry moulding materials. Mr. R. M. Chapman (K. & L. Steelfounders & Engineers, Limited) also retired from the committee on taking up an appointment at Loughborough College.

Plant Engineering Committee: Mr. J. Buchanan (Parker Foundry (1929), Limited), Mr. L. R. Evans (English Steel Castings Corporation, Limited), and Mr. R. H. Whatmough (David Brown Industries, Limited) were appointed.

Steelmaking Committee: Mr. E. Creswick, formerly of Catton & Company, Limited, retired from the committee on taking up an appointment in Canada, and Mr. T. A. Cosh, formerly head of the Association's steelmaking section, was invited to join the committee on joining the Alston Foundry Company, Limited.

General Metallurgy Committee: Mr. P. Jubb (Brown-Firth Research Laboratories), Mr. J. Taylor (David Brown Industries, Limited) Mr. N. Tranter (F. H. Lloyd & Company, Limited), and Dr. B. H. C. Waters (K. & L. Steelfounders & Engineers, Limited) joined the committee. Mr. R. Liston, formerly of Wm. Beardmore & Company, Limited, resigned from the committee on leaving that company's service.

In December, 1956, the general metallurgy committee set up by a sub-committee with Mr. J. Blackburn (Bonnington Castings, Limited) as chairman to assist the staff of the Association in preparing a code of practice for the magnetic-particle method of inspecting steel castings. This work having been completed by the issue to members of a special publication in September, 1957, and an article in the *Journal* of the BSCRA for December, 1958, the sub-committee has been disbanded.

The Council and the director of research welcome this opportunity of expressing their indebtedness to these advisory committees for their valuable help.

Membership

It is satisfactory to report that a further four steelfoundry companies have joined the Association as ordinary members, namely: George Blair & Company, Limited, Tow Law, Co. Durham; R. B. Tennant, Limited, Coatbridge, Scotland; Phosphor Bronze Company, Limited*, Birmingham, and W. A. Baker & Company, Limited, Newport, Monmouthshire. The membership of George Blair & Company, Limited, includes also their wholly-owned subsidiary, Springfield Steel Company, Limited, Glasgow. These additions bring the total number of ordinary members to 64. The Mond Nickel Company, Limited, has been admitted as an associate member, bringing the total in this grade to 11.

DSIR Visitors and Staff

Professor G. Wesley Austin and Dr. C. J. Smithells have continued to act as the Department's Visitors during the year, and their interest in the Association's affairs, and the support which they gave to the Association's application for renewal of grant-aid, have been much appreciated by the Council.

The Council also places on record its appreciation of the helpful advice and ready co-operation which it and the permanent staff receive from the officers of the Department.

Research Facilities

Accepting a recommendation of the research committee, the Council has approved a scheme of extension to the research station. The cost during the next financial year will be approximately £40,000 for buildings, and £12,500 for equipment, resulting in a 75 per cent. increase in accommodation. In coming to this decision, the Council has recognized that the present premises were designed for a staff complement of less than 40 and a level of activities related to an annual industrial income of less than £40,000, and that additional laboratory accommodation as well as space and facilities for pilot-scale experiment are essential.

Staff

Mr. T. A. Cosh, B.SC., F.I.M., head of the steelmaking section, resigned from the Association's staff at December 31, 1958, to take up an appointment with the Alston Foundry Company, Limited. Mr. C. M. Stoch, DIPL.ING., F.I.M., head of the plant engineering section, has been appointed acting head of the steelmaking section while retaining his former appointment. Mr. J. Turton, B.MET., formerly of K. & L. Steelfounders & Engineers, Limited, joined the research staff in the steelmaking section and Mr. J. Beech, B.MET., who graduated from Sheffield

* This company has since discontinued foundry operations. —Editor.

University with first-class honours in metallurgy and won the Mappin Medal and Premium for 1958, joined the physical metallurgy section. Mr. M. Palfreyman, B.MET., the Association's bursar in the refractories department of Sheffield University, was awarded the Frank Holland Memorial Prize for 1958 by the University. With the object of assisting the recruitment of suitable graduate investigators, the Council offered bursaries tenable for one year in the metallurgy departments of Birmingham and Sheffield Universities, to enable two graduates to take master's degrees prior to joining the Association's staff. However, it was possible to make only one appointment, and Mr. L. J. Watkins, B.SC., is holding the bursary at Birmingham, and will join the staff of the Association in August, 1959.

Conferences and Meetings

A heavier programme of meetings, mainly for the discussion of the Association's work with members, has been held during the year than in any previous year. In addition to the Annual Conference, a one-day conference and six area discussion meetings have been held.

The 1958 Annual Conference was held at Harrogate on October 23 and 24, the subject being "Steelmaking and the Properties of Steel Castings." More than 150 representatives of members and others closely connected with the Association's work in this field attended. A special welcome was given to Mr. C. W. Briggs, technical and research director of the Steel Founders' Society of America, who presented the exchange lecture from the Society; and to Mr. F. E. Ireland, H.M. Deputy Chief Alkali Inspector, who made an important statement of policy concerning the implementation of the Clean Air Act in relation to steelfoundries. Four of the eight papers discussed at the Conference were presented by members of the Association's staff—a gratifying indication of the progress that has been made following only 18 months effective occupation of the research station.

It has been decided to supplement the annual conferences by one-day conferences on themes of more specialized interest. Two such conferences have been planned during the current year and one—on metallurgical analysis in steelfoundries—was held at York on December 4, 1958. It was attended by 73 delegates, representing 35 ordinary and 3 associate members and a number of kindred laboratories. The second of the conferences will be held in Sheffield on April 30, the theme on this occasion being the high-frequency melting-furnace in steelfoundries.

Whereas on several occasions in previous years local meetings, discussion groups and demonstrations have been staged by the Association on an *ad hoc* basis, this year saw the inauguration of a planned programme of discussion meetings at which different aspects of the Association's research programme were presented for discussion by members. Three of the introductory talks were:

"Measurement and Control of Foundry Dust," by Dr. A. H. Sully and Mr. C. M. Stoch; "Causes of Poor Mechanical Properties in Steel Castings," by Mr. W. J. Jackson and Mr. J. D. Lavender; and "Reclamation of Used Moulding Sands," by Mr. J. M. Middleton and Mr. R. H. Brown.

These talks were delivered at meetings in Glasgow, Derby, Darlington and Sheffield. The fourth talk in the series will be on oxygen injection, and will be presented in Glasgow in April and in Birmingham in May, 1959, by Mr. C. M. Stoch and Mr. K. Knaggs.

Refresher Courses

Last year's decision to inaugurate a scheme of refresher courses for technical supervisory staff from member companies was warmly welcomed by the industry. Four further courses have been held, each for approximately 10 representatives of members, two of these courses being on the subject of moulding materials and two on steelmaking practice. The demand for the moulding materials course continues, and further courses comprising approximately eight lectures and practical sessions over a period of three and a half days will continue to be held at the research station at about six-monthly intervals.

Publications and Ciné Films

The *Journal and BSCRA Abstracts* have continued publication regularly throughout the year. The latter now incorporates additional supplements for overseas members and associate members.

A large number of translations have been prepared by the Association's staff or acquired externally and made available to members, and important additions have been made to the information section's series of bibliographies.

Two special publications have been issued—"A Practical Guide to the Design of Steel Castings" and "Data Sheets on Dust Collectors." The former is an English-language edition of the book published by the *Centre Techniques des Industries de la Fonderie* in French, and has been placed on sale to the public. The British Steel Founders' Association has co-operated with the Research Association in effecting distribution, and the Penton Publishing Company, Limited were appointed the Association's distributors in the United States. Over 1,400 copies of the publication have already been sold.

"Data Sheets on Dust Collectors" was published as a preliminary edition restricted to members and manufacturing companies who had supplied data. A second, enlarged, edition is now in preparation and will be placed on sale to the public in 1959. Substantial progress has also been made in the preparation of a second edition of "Data Sheets on Moulding Sands," and with a further special publication summarizing and comparing British and foreign specifications for steel castings.

A new film, "Let's Clear the Air," has been completed during the year. It depicts the activities of the Association in carrying out surveys of atmospheric dust levels in the foundries of members, and reviews good and bad practices associated with dust control in steelfoundries. The Association's use of ciné film for research purposes, and as a means of communication of research results, was recognized by the Department of Scientific and Industrial Research, which accepted a paper from the Association

at the conference on "The Use of Ciné Film in Industrial Research" in London on April 17 and 18, 1958, and which has nominated the director to take the chair at one of the sessions of the Harrogate Film Festival in April, 1959. The Association's film sequence showing convection currents and shrinkage phenomena during the solidification of a stearin wax ingot was accepted for showing at the British Association meeting in Glasgow in August, 1958.

Patents

The progress of several investigations during the last two years has enabled the Association to make application for several British Patents in recent months. One (No. 5725/59) is in respect of an exhausted fettling bench having special features to provide dust control and at the same time reduce noise levels; another (No. 11504/59) relates to a technique of steelmaking by means of which especially low sulphur levels may practicably be obtained.

It will be recalled that some two years ago the Steel Founders' Society of America assigned to the Association the right to apply for British Patents in respect of developments arising from SFSA-sponsored research on shell moulding. Two of the three Patent applications which were filed, relating to the addition of manganese-dioxide additions to shell-moulding mixes, and the use of forsterite and chromite in shell-moulding mixes, have been abandoned in the light of results from the Association's further investigations; but the third application (No. 1456/57), concerning the use of olivine in shell moulding, is being proceeded with.

Negotiations are in hand for the commercial exploitation of the Association's Patent (No. 774,147) covering the combined integral booth and exhaust system for swing-frame grinders.

The Association has filed opposition to the grant of British Patent Application No. 803,397, which deals with improvements in or relating to the production of casting moulds and casting cores (Dr. F. Raschig, GmbH).

External Relations

Liaison with the British Steel Founders' Association, whose chairman, Dr. Dadswell, is a member of the BSCRA Council, continues in a number of spheres. With the director's membership of their Industrial Health Committee and the common membership on the Councils of the two Associations, it was considered unnecessary to continue the life of the joint advisory committee on industrial health; but this will not affect the co-operation between the two organizations in this work. The contributions which each Association can make to a proper presentation of the industry's case with respect to the Clean Air Act has been recognized, and a joint approach was made to the Alkali Inspectorate by a delegation comprising the directors of the two Associations, Mr. R. F. Horton (chairman of the BSCRA plant engineering advisory committee) and Professor R. J. Sarjant (scientific adviser to the BSFA), at a meeting in February, 1959. Subsequently, the Alkali Inspectorate agreed to establish a working party on which Mr. H. W. Keeble (K. & L. Steelfounders & Engineers, Limited), Mr. W. Herring (Osborn Foundry & Engineering Company, Limited), the director BSCRA and Professor Sarjant will serve.

Discussions have taken place between the BSCRA and the BSFA, with a view to co-ordinating their activities, which are aimed at extending the markets for steel castings. Agreement has been reached for the establishment of a steel castings development committee to provide and disseminate data designed to promote the greater use of steel castings. The chairman of the committee will be nominated by the BSFA and the membership will comprise representatives of user interests in addition to steelfounders. The secretariat will be provided by BSCRA. BSFA have agreed to contribute the sum of £1,500 in the year ending March 31, 1960, to support additional investigational work by BSCRA in support of the committee's activities.

The Research Association gratefully acknowledges the assistance which it has received from the regional technical committee of the North-East Coast Association of Steel Founders in the conduct of an investigation aimed at elucidating the propensity to hot-tearing of CO_2-process moulding mixes. The Research Association has also been invited to participate in other BSFA regional technical committee activities, and has had the pleasure of welcoming visits from the Lancashire and Yorkshire Region and the Midland Region to the research station on February 25 and March 5, 1959.

The visit by Mr. Charles W. Briggs, technical and research director of the Steel Founders' Society of America, to the annual conference in October, 1958, provided further opportunity to strengthen the relationships between the Association and the Society. One direct outcome of the closer liaison is that the American Society no longer imposes a delay on their release to the Research Association of any of their research reports. Hitherto, the research reports that were regarded as having immediate practical application and commercial benefit were withheld from the BSCRA for a period of five years.

The investment-casting industry, having decided to establish a technical association, approached the BSCRA with a view to their providing a headquarters and secretarial services. Agreement was reached, and the secretary of the Research Association was appointed secretary of the British Investment Casters' Technical Association at their inaugural meeting on June 11, 1958.

Contact has also been established with the cast steel roll section of the Rollmakers' Association, and the BSCRA has provided library facilities for the Rollmakers' Association.

Information is also exchanged with several Research Associations, and specially valuable contacts with the British Iron & Steel Research Association and the British Cast Iron Research Association have been made and renewed during the year. The director has been elected to the

Scanning arrangement constructed for use with the immersion technique of ultrasonic inspection of steel castings. The immersion method appears to be promising in overcoming the problems associated with rough as-cast surfaces. This investigation is proceeding under contract for the Ministry of Supply.

Council of the BISRA.

Between April 9 and 22, 1958, the director visited two steelfoundries and six research centres in France, Switzerland, Germany, Holland and Belgium. The research centres were: *Giesserei-Institut, Technische Hochschule,* Aachen; *Institut für Giessereitechnik,* Düsseldorf; *Staubforschungsinstitut,* Bonn; *Technische Hogeschool,* Delft; *Metaalinstituut T.N.O., Gieterijcentrum,* Delft, and *Centre Technique des Industries de la Fonderie,* Paris. It was discovered during these visits that some work at the *Giesserei-Institut,* Aachen, had a direct bearing on some of the Research Association's own investigations and a further visit was made there later by Mr. Middleton. Return visits to the BSCRA have already been made by Prof. Dr.-Ing. Wilhelm Patterson, *Giesserei-Institut,* Aachen, Prof. Dr.phil. K. Löhberg, *Institut für Giessereitechnik,* Düsseldorf, and Prof. Dr. A. J. Zuithoff, *Technische Hogeschool,* Delft.

A substantial contribution to the activities of the Institute of British Foundrymen is made through the Director's membership of their Council and Technical Council, and by staff appointments to eight of their technical sub-committees.

The Association was privileged to receive a visit from HM Chief Inspector of Factories and senior members of his staff on January 9, 1959, and was gratified by the complimentary remarks of Mr. T. W. McCullough upon the extent and progress of the several investigations proceeding in the industrial health field.

Information and Advisory Services

Full use continues to be made of the library and information service, and the service itself continues to provide a complete coverage of the world literature relating to steelfoundry and allied topics. The general growth in interest in Russian literature has been reflected in the BSCRA library, and the location, acquisition and preparation of translations from the Russian and other languages is an ever-increasing activity. The Steel Founders' Society of America is now buying translations through the BSCRA library.

The number of technical inquiries, some of them involving a limited amount of laboratory work, reached the figure of 515 during the year. This represents an increase of approximately 70 per cent. as compared with the previous year.

Direct contacts with members also continue on an increasing scale. The number of visits by staff to members (110), and the number of visits by members to the research station (60), indicate that the value of direct personal contact is well understood and appreciated by the Association and a substantial number of the members.

RESEARCH

Substantial progress has been made with most of the projects which constituted the research programme for 1958-59. Consequent upon this progress, three projects are omitted from the programme for 1959-60 and are replaced by three new projects. A short account of the work conducted during the past year is presented below.

Steelmaking

Oxygen Injection

Oxygen Injection for Carbon Removal: Control charts and tables have been constructed which can be applied to the production of plain carbon steel melts, to determine the value of oxygen required to be injected to give a required carbon removal from a predetermined carbon level at temperatures prior to injection of 1,500, 1,550 and 1,600 deg. C. The

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use of these charts should lead to economies in the use of oxygen since (*a*) the volume of oxygen required is known, and (*b*) the necessity of blowing until the carbon flame drops is obviated. This means that blowing can be terminated at a higher carbon level where necessary, thereby also economizing in pig-iron or other recarburizing materials.

Foundry trials using these control charts have been conducted by six members of the Association's steelmaking advisory committee, and results in agreement with predictions have been obtained in furnaces of up to 10-tons capacity.

Injection of Oxygen/Air Mixtures: Work has been carried out on the dilution of oxygen with air in order to determine the effect on carbon and metalloid removal, and hence to determine whether economies in the use of oxygen can be effected. The results obtained show (i) that the increased agitation caused by the ballast nitrogen does not increase the efficiency of carbon removal, and (ii) that the cooling effect of the ballast nitrogen allows the manganese content to be reduced to less than that obtained in normal oxygen practice. This technique may have an application in the production of low-manganese steel castings for the electrical industry. Analyses show that the nitrogen pick-up during oxygen/air injection is not serious, being only of the order of 0.0004 per cent. from the beginning to the end of the blow.

Phosphorus removal during Oxygen Injection: Preliminary work has shown that phosphorus could be removed from initial levels of approximately 0.1-per cent. P before O_2 injection, to a level of well below 0.02-per cent. P after injection, by the simple expedient of commencing the injection of oxygen at low metal-temperatures (1,500 deg. C.) and adding limestone during the blow, thus minimizing the temperature increment and maintaining a highly basic slag. Unfortunately, even though extreme care was taken during slagging off, reversion of phosphorus occurred during the reducing period, so that final phosphorus in the castings was of the order of 0.03 per cent. Further work is in hand on this technique, with the object of minimizing phosphorus reversion.

Fume Generation: A study has been made of the effect of foundry steelmaking variables on the generation of fume during oxygen injection. Two practical points have emerged:

(1) that for a given oxygen-input rate the amount of fume increases with increasing mean carbon content (*i.e.*, the average of the initial and final carbon contents).

(2) that for a fixed mean carbon level the amount of fume increases as the oxygen-flow rate increases.

By sampling the fume simultaneously at different levels within the furnace and in the duct above the furnace door, it has been found that a major portion of the samples collected within the furnace consisted of elemental iron, whilst that collected in the duct was mainly iron oxide. This seems to indicate that the fume, when first formed, consists of elemental iron.

Reduction of Refining Slags

One of the objects of this project is to minimize the gas content of molten steel, when tapped, by minimizing the time from the end of the carbon boil to the time of tapping. This has been taken to the extreme in several heats made by a complete reversal of the customary practice, in that the steel charge was melted out under a reducing (falling) slag which was later removed and replaced by an oxidizing slag. Oxygen was injected to effect carbon removal, the oxidizing slag pulled off, and the heat finished as rapidly as possible with only a thin protective reducing slag cover. It has been found possible by this method to obtain sulphur contents in the castings of less than 0.01 per cent., since a longer time under reducing conditions was feasible without irremovable gas pick-up. Encouraging results have already been obtained from further work aimed at reducing the duration of the reducing period.

Foundry Processes and Moulding Materials

Factors affecting the Surface Quality of Steel Castings

Mould Paints and Washes: Preliminary investigations have been concerned with the room-temperature properties of zircon and silica mould paints, *viz.*, the suspending power of the medium, the viscosity and specific gravity of the paint, the friability of the dried film and the factors responsible for the formation of cracks on drying.

A variety of suspending agents has been examined, and viscosity measurements have been made on a series of paints and related to such variables as specific gravity, percentage suspending agent and the thickness of the paint film when applied to the sand surface in a standard manner.

The susceptibility of the applied paint film to crack during drying has also been investigated. This cracking is due to shrinkage of the paint film, and may arise from either an excess of clay or binder in the paint, or from poor packing of the refractory. The friability of paint films has been measured by a simple abrading test, and the stability of various paints at different drying temperatures determined.

High-temperature tests are now in progress, and dip and casting tests have yielded some information on the behaviour of mould paints of various compositions when in contact with molten steel. A test casting has been designed in which different ferro-static heads can be simulated by the application of air pressures to the solidifying casting.

Factors affecting the Erosion of Moulds by Molten Steel: A satisfactory test-casting has been developed which shows erosion effects and gives reproducible results. A study has been made of the erosion of a thin vertical plate by a downward stream of metal. The sides of the plate are formed by two cores of the sand under test pressed to a predetermined density. Tests carried out on green- and dry-sand compacts of various densities, bonded with a Wyoming bentonite, indicate:

(1) With low densities erosion is severe, and this becomes less as the density of the compact increases. At a certain optimum density, however,

Apparatus for the accurate determination of the green strength and deformation of sand mixes. It was designed and constructed at the research station because the conventional apparatus was not sensitive enough for the low green strengths to be measured. It is widely used in testing the bonding properties of cereal binders.

a further increase in density causes expansion scabs to occur, and the higher the density above this optimum, the greater is the degree of scabbing.

(2) The optimum specific gravity of compacted sand to prevent scabbing and give the best resistance to erosion is 1.59 for dry-sands and 1.54 for green-sands. Therefore, a dry-sand may be rammed harder than a green-sand without scabbing, with a resulting improvement in resistance to erosion. These tests have been repeated with a calcium bentonite as the bond, and the results indicate that a combination of scabbing and erosion may occur which is more severe than was obtained with the Wyoming (sodium) bentonite bond.

Friability of Green-sand Moulding-mixes on Air Drying: Apparatus has been constructed for measuring the friability of green-sand moulding-mixes. A standard specimen is revolved beneath a falling stream of metal shot, and the loss in weight of the sand specimen caused by the abrasion of the shot is used as a measure of the friability of the sand. Initial work was concerned with determining the optimum conditions of height and weight of the falling shot, and speed of rotation of the specimen. Tests on normal green-sand specimens show that there is an optimum moisture content below which the sand becomes very friable. This optimum moisture content is very similar to that which gives the optimum green strength, and for bentonite-bonded sands is around 2 to 3 per cent. The effect of different bentonite contents at varying moisture contents has been determined, and work is now proceeding to determine the friability of sands of various compositions, when allowed to air dry for different times.

CO_2/Sodium-silicate Process

Work on the collapsibility of CO_2/sodium-silicate mixes by hot-tear tests has continued in collaboration with the North-East Coast Association of Steel Founders regional technical committee. A satisfactory hot-tear test-casting has been developed, and has proved to be reproducible and sensitive to variations in the moulding material. Under these conditions, it has been found that the propensity towards tearing is no greater with CO_2-process sands than with normal dry-sand mixes, and that, of the different mixes examined, tearing was most severe with oil-sands and least with green-sand mixes. The addition of organic materials, *e.g.*, cereals, molasses, etc., to CO_2 sands increased the severity of tearing, whereas small additions of clay reduced, or prevented, tearing.

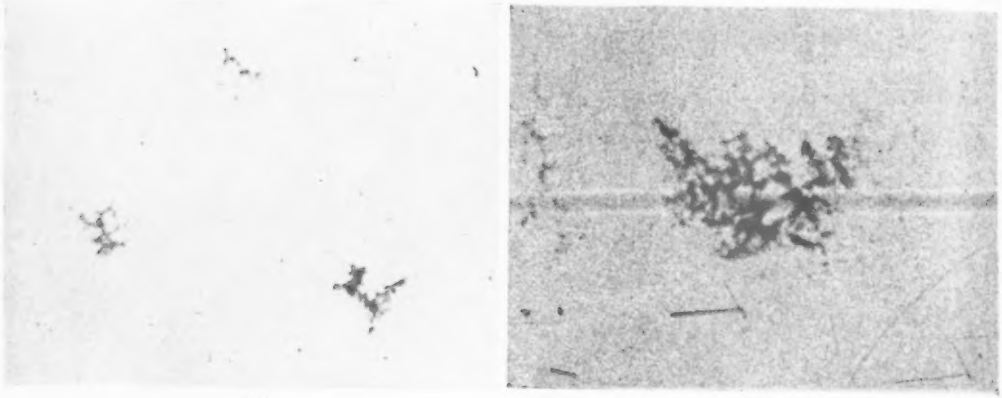
Work has also continued to assess the effect of additives, such as clays, sodium hydroxide, etc., upon the room- and high-temperature properties of sodium-silicate/CO_2 mixes. It has been shown that, whilst clay additions lower the air-setting strengths of sodium-silicate mixes after gassing, they improve the initial green-strengths and lower the retained strengths of the mixes after heating within the range 700 to 1,100 deg. C. The retained strengths after heating within this range are closely related to the knock-out properties of the sand after casting.

Kaolinitic Clays

Several member-foundries have been supplied with experimental batches of the mixed bentonite/ball-clay binder formulated by the Association, and have expressed satisfaction with the behaviour of the clay. These foundries are now using kaolinitic/bentonite mixtures of their own under foundry production conditions. The foundry first engaged on the trials with the clay mixture has now been using it for almost three years with satisfactory results.

Data Sheets on Moulding Sands

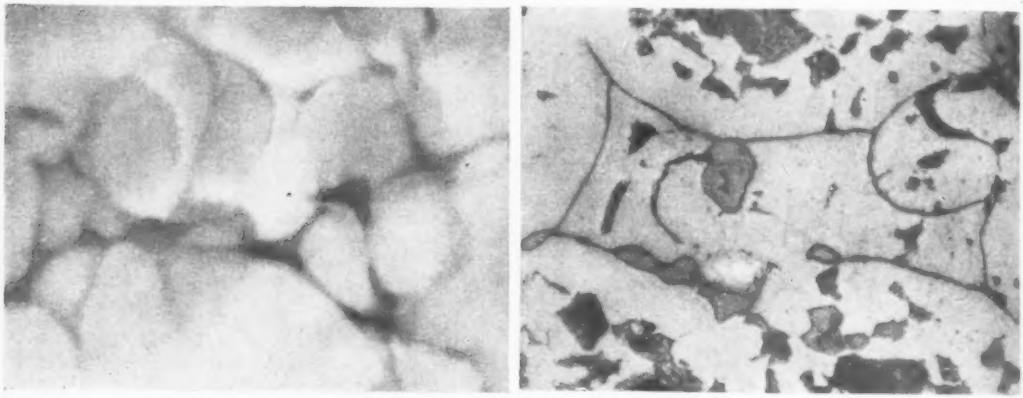
Data sheets on a further 15 sands have been completed. These will be issued together in a new

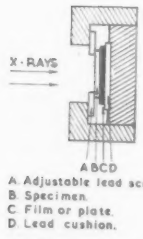


(*a*) (*b*)

For the detection of microporosity or other small defects, a technique developed at BSCRA involves preparation of a thin slice of metal approx. 0.020 *in. thick, by surface grinding. The specimen is radiographed with X-rays from a crystallographic X-ray tube as shown in the sketch below (col. one). Typical microshrinkage areas are illustrated in (a) and (b), at magnifications of* ×12, *and* ×20, *respectively. The use of a maximum-resolution plate permits examination of the radiograph at high magnifications. A defect* ×150 *is shown in (c), with a photograph of the same area at* ×150 *in (d).*

(*c*) (*d*)





edition of the Association's publication on this subject, which will also contain some modifications to the existing data sheets to bring the information up to date.

Mould- and Core-bonding Agents

Amongst the bonding materials examined were a proprietary dextrose binder and two binders based on water-soluble cellulose ethers. The dextrose binder showed some advantages over normal binders for core purposes, *e.g.*, quicker drying and faster collapsibility, while the cellulose binders were generally inferior in properties to the more conventional cereal and oil binders. In view of the current interest in air-setting oil binders for cores and moulds, a survey has been made amongst the foundries using these materials. Further work on four oils available in this country is proceeding in the laboratory, and this includes testing properties such as tolerances to moisture and clay, and the bench life of the mixes.

Flowability of Moulding Sands

Work at BSCRA Laboratories: Some compaction tests have been made with various sand mixes using a jolt-squeeze moulding machine under standard conditions. These showed that increasing the moisture content of a bentonite/sand mix from 2.25 to 5.6 per cent., whilst having little effect

on mould hardness, caused a marked increase in the bulk density of the mould. Other findings were that the green compressive strength of the mix had little effect on compaction properties, and that generally sands containing kaolinitic clays rammed harder than did sands containing bentonite. The problem of flowability is also being investigated by studying the effects of grain size and grain-size distribution of the sand.

Work at Sheffield University: The object of these investigations is to throw light on the influence of the bond on the compactibility of the moulding sands. For this purpose the flow properties of clay-water mixtures at the consistencies at which they occur in the sand are being investigated. Following preliminary work with a capillary-type viscometer, a shearing-plate viscometer has been constructed. In this apparatus the clay-water mixture is sheared between two parallel stainless-steel plates, the relative movement of the plates being recorded electronically, using a dynamic-strain recorder. This apparatus is very sensitive, and is capable of measuring very small strains at strain rates of up to 100 mm./mm./sec. in films down to 0.1 mm. in thickness. The results show that, at all moisture contents in the workable range, a rapid deformation occurs when the load is first applied, this being followed by a slower deformation when the load is maintained. The amount of strain occurring during the first stage, and the rate of strain to the point of rupture, both increase as the stress increases, and as the moisture content increases at constant stress. So far, all the results have been obtained under conditions of constant stress, but the apparatus has now been modified to permit the behaviour of the clay to be observed at a constant rate of straining. Preliminary work with the modified apparatus has shown that films of a ball clay become increasingly brittle as the rate of straining increases. It is believed that this method of investigation will give a better insight into the behaviour of the clay bond under conditions of jolt ramming.

Metallurgy

Microporosity in Steel Castings

Progress with microporosity in steel castings has been greatly enhanced by the development of a technique which has been called semi-microradiography. This involves the use of specimens ground to 0.020-in. thickness or less—with high-resolution plates, X-radiographs are produced which reveal micro-defects with good definition at magnifications of the order of 20 to 30 times (see facing page). The semi-microradiographs are assessed by using a counting technique, and by this means any particular area of a casting may be quantitatively assessed for its microporosity content. By this method it has been confirmed that there is a close quantitative correlation between microporosity and ductility.

It has been shown that the ductility of similar samples of cast steel containing equal amounts of microporosity could be improved by heat-treatment. Pressure tests have also revealed that, for sections of 0.030-in. thickness, the micro-cavities can be continuous and inter-connected.

Investigations on the effect of pouring temperature and composition have been commenced, and a number of castings have been made using compressed-air feeder-heads. Semi-microradiographic and tensile-test results so far obtained have indicated that pressure feeding has not improved soundness and mechanical properties.

Magnetic Properties of Cast Steel

Work has continued to determine the effect of residual elements on the magnetic properties of high-permeability steel castings. This work has confirmed the importance of controlling the content of residual elements, but further work has been suspended until vacuum-melting facilities are available to facilitate control of the many variables that are important.

Influence of Rare Earth Additions and Complex Deoxidants on the Properties of Cast Steel

Low-temperature impact properties and room-temperature tensile properties have been measured on steels which had been deoxidized in the ladle by a variety of different treatments. The steels employed were medium-carbon and pearlite-manganese types, which were cast into keel and clover-leaf test-blocks. The results obtained have been somewhat inconclusive, due to the difficulty of controlling all the minor variables in steel made by normal commercial processes. This subject will be re-opened when facilities for vacuum melting become available.

Heat-treatment of Steel Castings

The object of this investigation is to determine the influence of heat-treatment on the mechanical properties of castings of different masses, in order to find whether or not heat-treatment cycles can be shortened. Preliminary work was concerned with the development of suitable test-castings of 1-in., 3-in. and 5-in. sections, and the determination of heating rates and thermal gradients within the blocks and the heating furnaces used. Experimental heat-treatments have been applied to a 0.3 per cent. carbon steel heated at various temperatures related to the Ac_3 temperature, and cooled at different rates with and without subsequent tempering. The results indicate that the rule "1 hr. per inch of section" should not be applied without regard to the temperature used and subsequent rate of cooling, and more exact relationships will be established as the result of further work now in hand.

Surface Inclusions in Steel Castings

Work has been carried out with the co-operation of AERE, Harwell, with the object of finding a suitable method of radio-actively labelling sand so that mould erosion may be studied. This has now been achieved and foundry trials are at present being planned.

Relation of Crystal Orientation to the Results of Impact and Bend Tests

The purpose of this project is to examine, in plain carbon and 18/8-type stainless-steels, the effect of both dendritic formation and preferred

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crystal orientation on impact and bend properties. Preliminary work has been directed at designing a test-block casting containing columnar crystal zones large enough to permit the preparation of mechanical test-pieces from them. A horizontally-cast 3-in. square block, chilled over the entire top face, has been found satisfactory. A number of these blocks have been made in 0.3 per cent. carbon steel, and tests are now in progress.

Physical Data on Cast Steels

A summary on physical and mechanical properties of the commonly used carbon, low-, medium- and high-alloy steels has been made with the co-operation of several member firms. Physical data are largely lacking on plain carbon, low- and medium-alloy cast steels. Preparations are therefore being made for the experimental determination of several physical constants for a range of steels in this category. Arrangements are also being made for tensile tests to be done on test-pieces machined to the various proportional systems, to enable empirical relationships to be established between the percentage-elongation values obtained from cast steels tested in accordance with these various systems.

Intergranular Fracture in Steel Castings: Work at Sheffield University, under the direction of Dr. R. G. Ward, was commenced in October, 1958.

Plant Engineering

Sand Reclamation

The Association has carried out trials on the following methods of sand reclamation: a dry pneumatic scrubbing unit; a pilot-scale log washing plant; two types of wet scrubber. Wet-scrubbing methods have considerable promise, and it has been shown that it is possible to reduce the clay content of used sand to a level approximately equivalent to that of new silica sand, and to use this sand satisfactorily for facing sand and for core production. This has been substantiated by foundry trials. In addition, the Association has built a small experimental unit which it is hoped will enable a more satisfactory technique for dry reclamation to be evolved.

Moulding-sand Compaction and Moulding Machines

An extensive investigation has been made into the degree of compaction of moulding sand at various points on a standard pattern in relation to a range of sqeeze pressures, jolt stroke and time, and with sands with various green strengths. This has led to a definition of the optimum conditions of machine operation, and these results have been confirmed on moulding sands prepared in production mills in two member firms. Tests are also being carried out on the effect of squeeze pressures exceeding the pressures available on the jolt-squeeze moulding machines.

Efficiency of Shot-blasting

Examination of the physical properties of 30 samples of abrasives has been completed. A testing machine has been made which is designed to compare, for various abrasives, the cleaning efficiencies, rates of breakdown and wear on machine parts. Tests of the abrasive samples in the machine are now proceeding and the results of these are to be compared with the physical properties to assess which of the latter give the best indication of the "quality" of the abrasive. A comparison is also being made, simultaneously with the examination of the abrasives, of the rates of wear of throwing-wheel blades and wear plates used in the machine, which are made from different wear-resistant alloys.

Chemical Methods of Cleaning Castings

Three proprietary processes of chemical cleaning have been investigated. From the tests carried out, it can be confirmed that all three processes are capable of removing adhering sand. In the case of sand penetrated with metal, the process of sand removal is very slow as the reacting liquids have to penetrate between the probes of metal. The surface of the casting remains rough and still requires dressing.

Industrial Health

Atmospheric Dust in Steelfoundries

The results of the survey, completed in 1957, of atmospheric dust in the dressing shops of 58 member firms have been carefully examined, and correlation between dust concentration and work load, shop volume and ventilation has been sought. Bulk airborne-dust samples of every fettling-shop process have been collected, in order to determine their characteristics and their contribution to the overall dust concentration in foundries. The development of a magnetic-separation technique has permitted a closer investigation of the non-magnetic fraction of foundry-dust samples, without the masking effect of a high percentage of iron oxide.

Efficiency of Dust Collectors

The first issue of "Data Sheets on Dust Collectors" has been received very favourably by member firms. Further sheets are being added and, when an expanded issue is ready, it is intended to give this publication a much wider circulation. Tests have been completed on a new type of air filter from South Africa, and the isokinetic sampling of dust in ducts has been standardized. Considerable experience has been gained in sampling and determining the particle-size distribution of such dust by sedimentation methods.

Dust Control on Portable Fettling Tools

An assessment has been made, and a statement published to members, regarding the usefulness of the low-volume high-velocity system for controlling dust on portable fettling tools. A film has been made illustrating this study, and a copy supplied to the manufacturers of this system. An exhausted fettling bench incorporating features of both noise and dust control, which has been built at the research station, showed a satisfactory dust control. This bench has been installed in the fettling shop of a member foundry, and has performed satisfactorily under production conditions. Another prototype bench, of a circular form, which it is thought should have practical advan-

tages, has also been constructed and tested in the research station.

Noise Abatement in Foundries

Pending the building of a demonstration booth incorporating the principles of noise abatement, a number of general recommendations have been prepared and issued. It is hoped that these recommendations will enable members to take simple and effective steps to control noise levels, and prevent financial wastage due to the building of unsuitable structures.

Silicosis Hazards in Steelfoundries

Animal experiments have continued at Reading University (sponsored jointly by the Association and Imperial Chemical Industries, Limited) to determine the relative toxicity of dust from normal synthetic moulding-sand and CO_2/silicate-process sand. It is anticipated that a definitive stage in this work will be reached during the coming year.

Operational Research

One of the Association's senior investigators has attended a course in work study organized by the operational research unit of DSIR. He was subsequently attached to the DSIR unit for a further period to acquire experience in this field. With the ready co-operation of a member-firm, a study was made of the operation of a steelfoundry core-shop. The study was of one week's duration, and was carried out by two members of the DSIR unit assisted by the member of BSCRA staff referred to above. The results of this study were incorporated in a report (published in summary form in *Journal* No. 44, December, 1958), which recommended changes in layout of the core-shop to facilitate production. The member firm has expressed appreciation of this pilot exercise.

* * *

The Report is signed by Mr. C. H. Kain (chairman) and Dr. A. H. Sully (director of research).

British Exhibition in USA

With the purpose of publicizing the British way of life and boosting British industry throughout the North American continent, plans on an elaborate scale are being made for the British Exhibition and Trade Fair to be held in June next year at the Coliseum Exhibition Building, New York, USA. Organized by British Overseas Fairs, Limited, the Exhibition has the backing of the British Government, the Dollar Exports Council, the Federation of British Industries and the British-American Chamber of Commerce in New York.

The Government is spending £100,000 on its exhibit, which will occupy the whole of the first floor of the building. Companies in the motor-car industry have booked a section comprising over 7,000 sq. ft., for the showing of one model from each range of cars selling in the American market. Other motor-transport companies will be participating as will also many well-known British heavy- and light-engineering firms.

Space rates are being kept as low as possible, exhibitors being charged only about half the actual cost of the Exhibition; it is expected that the other half will be recouped from gate receipts.

Bolton Diploma Course?

Bolton Technical College, Manchester Road, Bolton, Lancs, has recently extended its patternmaking and foundry classes to meet an increasing demand for better-trained personnel to service the industry. It is true to state that of the existing arts and crafts still being practised in modern industry, the heaviest concentration is in the foundry, and exhibited by the moulder and patternmaker.

The progress of the courses in foundry practice at the Bolton College during the past six years has been truly heartening, as all sections of the industry have co-operated, the employers having been particularly generous, whilst in the background the College authorities have financed, perfected, and made the various schemes and projects possible, with the result that *wastage of students has been cut to a minimum.* In the final City and Guilds examinations over 90 per cent. of the students presented have been successful.

The courses have always been realistic and sight has not been lost of the main aim of the foundry industry, "the production of a good casting more cheaply and quickly than anyone else." To this end, the College staff has been carefully selected to give a balance of practical, technical and theoretical experience, against a background of years of responsibility in the industry itself. The workshops and laboratories are well equipped and planned, and in their use, foundry problems involving sands, metals, testings and so on are thoroughly investigated.

New Scheme

Having received generous support by the industry and by interested foundrymen, the Bolton Educational Authority has now presented a scheme, sanctioned by the Ministry, and supported by regional industry, for a sandwich course in foundry techniques and technology, leading to a recognized foundry diploma over and above existing qualifications. This has meant the reorganization, re-equipping and extension of existing foundry workshops and laboratories so that it is claimed "the College foundry, when completed, will be the most modern and best equipped in the country for experimental and production purposes." In the laboratories, physical, microscopic and chemical equipment will be in constant use. The ancillary subjects are dealt with and production, organization, management, commercial English, mathematics and statistics have been catered for in a realistic and well-formulated syllabus including works visits.

Other Facilities

While the diploma sandwich course is of great interest and importance, facilities are being extended for the normal four-year courses in foundry and patternwork for part-time day-release students. Existing foundry requirements have not been overlooked and a series of post-advanced lectures in the form of two short courses have again been arranged for responsible foundry personnel. The lectures will be given by specialists who are recognized authorities in their own field, and the courses will take place on Wednesday afternoons at 2.0 p.m.; firms are invited to nominate staff to attend. Similar courses last year were well attended and provided an impetus to more mature persons in the industry.

These studies are under the direct supervision of Mr. A. E. Bell, head of the mechanical engineering department, from whom further relevant information can be obtained.

New works for Ashmore, Benson, Pease & Company

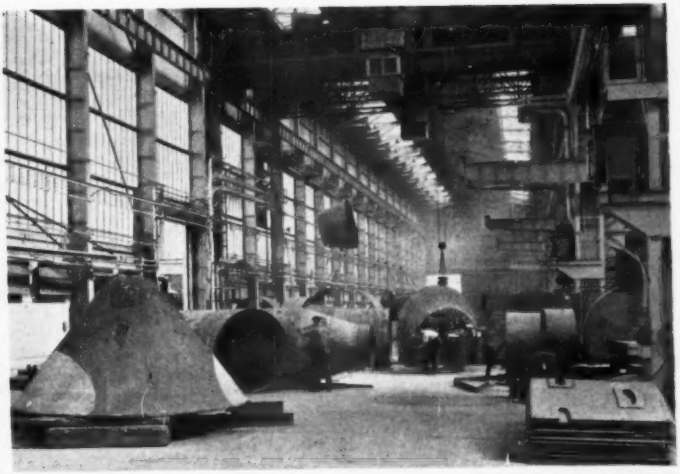
The Parkfield Works site at Stockton-on-Tees has been used by Ashmore, Benson, Pease & Company, for more than eighty years as an engineering works. From time to time the works were extended and buildings added until, in 1948, it was seen that any further extensions would inevitably result in loss of efficiency due to congestion. It was also apparent that both the size and layout of the shops were more suitable for the products turned out by the company in the earlier part of the century than for the heavier and more complicated plants produced to meet the present-day needs of industry. In January 1949, therefore, a decision was taken to rebuild the works progressively over a period of years on a new site, which is now known as the "South Works." A description of this site is given below.

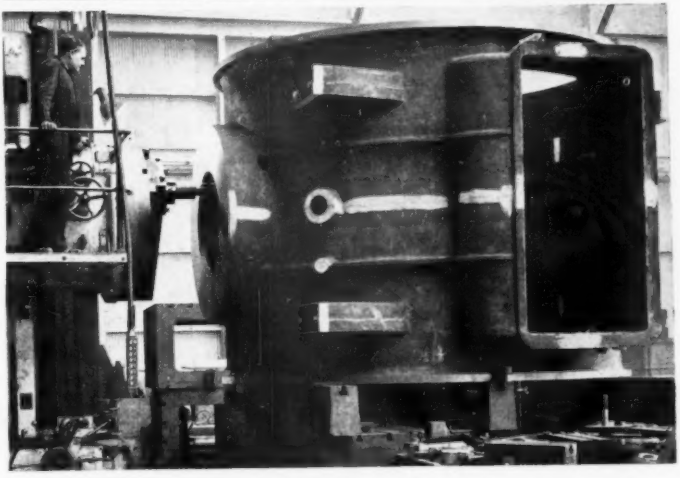
In January, 1949, the directors of Ashmore, Benson, Pease & Company, Limited were faced with the question as to what their customers would need in ten or twenty years' time—an answer to this question would have given valuable guidance in the planning of the projected new works. However, the fact that technical progress was moving at phenomenal pace meant that it was quite impossible to forecast developments even for a few years hence—let alone for two or three decades ahead. Fortunately, past experience furnished certain basic principles, and these proved immensely valuable in laying plans.

Basic Principles

It was regarded as certain that the company's products would become larger in the years ahead, and that they would be produced from materials yet to be developed to closer tolerances and higher standards of quality. There was no doubt therefore that any new works must be planned on a far larger scale than any envisaged before, and that ample accommodation must be provided for a first-class team of engineers and technologists. From this reasoning emerged the broad principles behind the layout of the new works. The decision was made to provide each production department with twice the existing floor area which it then occupied, with room for redoubling in a logical manner in the years ahead. Similarly, room was to be allowed for the quadrupling of office accommodation. Above all, flexibility was to be the keynote of the new

Miscellaneous castings in the new machine-shop at the South Works of Ashmore, Benson, Pease & Company.





Further views of the new works: (above) a drop-hammer casting marked ready for the machine-shop; (top right) the south high bay of the constructional shop, and (right) work in progress on a 13½-ton evaporator casting in the heavy machine-bay.

works, in order to be ready for any developments the future might hold.

First Stages

To implement this decision a site of 125 acres was secured, about half-a-mile south of Parkfield works. Then, after the overall layout of the factory had been decided, the detailed planning of the stage-wise construction adopted began. The first stage of the new constructional shop consisted of 132,000 sq. ft. of covered floor area with ancillary services and buildings—this came into production in the summer of 1951, since which time the shop has been further extended to give a total floor area of 200,000 sq. ft. The next stage of extension consisted of building a structural bay, adjacent to the constructional department, which added 27,200 sq. ft. to the shop and provided much improved facilities for the fabrication of structural steelwork, as distinct from the manipulation of plate in the main constructional shop.

Subsequent Work

The most recent step in the development has been the completion of the machine- and fitting-shops under one roof, and the provision of a working area of 160,200 sq. ft. This part of the programme has been concluded only as recently as June 1959, with the installation of the latest of the new heavy machines. To date about £3,000,000 has been spent on the new works, though only a small proportion of the 120-acre site has yet been used.

Encouraging Results

In the ten years since the original plans were drawn up many radical and rewarding changes have been noted. For instance, the company's turnover has been quadrupled, while its staff has doubled.

E

New Works for Ashmore, Benson, Pease

The weight of the biggest job produced has trebled, and many materials have been used which had not yet been developed during the planning days of 1948. There is abundant proof that the original plans were well founded, and plenty of room for further progress in the years that lie ahead. The general foundry is still at the Parkfield Works (this was described briefly in the JOURNAL of June 11, 1959, when reviewing establishments to be visited by IBF Conference parties).

* * *

(The principal products of the works division of Ashmore, Benson, Pease & Company, Limited include all types of heavy industrial plant and machinery, particularly that used in the iron and steel, chemical, gas and petroleum industries. All classes of pressure vessels to B.S.S.1500, A.S.M.E., A.O.T.C., Lloyd's Class I and II, and U.K.E.A.E. specifications are produced, and other design codes fabricated from mild or stainless-steel, nickel, Monel, Inconel or clad materials. Braun heat-exchangers and heavy high-quality welded fabrications are also made. The maximum weight of work that can be manufactured complete is limited mainly by transport considerations to about 100 tons, although equipment in excess of this weight can be produced in special circumstances.)

IBF Golf Meeting

As fine weather usually attends the annual competitions of the Golfing Society of the Institute of British Foundrymen at Woodhall Spa, this year's meeting in the same venue was no exception. About 40 members attended, most of them accompanied by their ladies, the meeting occupying the weekend commencing Friday evening, September 25, until Sunday afternoon. Despite the dryness, the course was in quite good condition and excellent scores were recorded in the various events, a record low net figure for the Society being returned for the Medal Round on Saturday morning.

The various results are recorded in what follows:—

Saturday morning: Stroke competition for the IBF handicap and Scratch Cup (34 competitors).

1. R. Plant	92—26=66	Winner Handicap Cup.
2. C. T. Sandford ..	98—24=74	
3. C. S. Bosworth ..	90—15=75	(best over last 12 holes).
4. H. H. White ..	82— 7=75	Winner, Veterans Prize.
5. J. G. Phillips ..	81— 5=76	Winner, Scratch Cup.
6. W. E. Aske	94—17=77	
7. E. Clipson	94—17=77	
8. D. Killingworth ..	97—19=78	
9. V. Brackenbury ..	95—17=78	
10. J. Bell	93—14=79	
11. P. B. Higgins ..	85— 6=79	
12. E. W. Pugh ..	91—11=80	
13. E. Jarvis	103—23=80	
14. J. Moran	107—25=82	
15. R. C. Shepherd ..	95—13=82	

Mr. Plant and Mr. Phillips, in addition to holding the Cups for one year, also received a silver tankard each, this year donated by FOUNDRY TRADE JOURNAL, through Mr. V. C. Faulkner, one of the vice-presidents of the Society. The Veteran Cup winner also received a tankard, presented by Mr. W. E. Aske. The IBF Coronation Shield (held for one year) was awarded to the Lincolnshire branch—for the first time, despite the fact that the teams were "playing at home." The three Lincolnshire representatives on this occasion were Mr. C. S. Bosworth, 75, Mr. E. Clipson, 77 (and Mr. D. Killingworth, 78).

Saturday afternoon: Two-ball foursome against bogey.

1. C. T. Sandford and C. S. Bosworth	2 up
2. P. G. Pennington and D. Killingworth ..	All square
3. R. T. Turner and W. H. Richards	1 down
4. E. W. Pugh and C. A. Anderson	2 down
5. T. Reynolds and E. C. Carrott	2 down
6. Dr. A. H. Sully and J. C. Howard	3 down

The winners each received a chromium-plated "Lincoln Imp" (together with a citation of its potency as a "charm") and a prize of golf balls in addition.

Sunday morning: Stableford fourballs (three-quarter handicap).

1. W. H. Richards and E. W. Pugh	44 points
2. P. G. Pennington and J. G. Phillips ..	42 points (decided on holes 10-18)
3. P. B. Higgins and G. W. Nicholls	42 points
4. T. Reynolds and J. C. Howard	42 points
5. J. Bell and E. Jarvis	42 points

The winners each received six golf balls as prizes.

Ladies' Competition (Saturday)

The Coronation Rose Bowl Competition attracted 12 competitors, the winner being Mrs. R. T. Turner with 37 points, and the score cards as follow:

1. Mrs. R. T. Turner	37 points
2. Mrs. V. Brackenbury	29 points

In addition to holding the Rose Bowl for one year, the winner was also given a "Lincoln Imp," presented by the Lincolnshire branch. Both first and second competitors received a prize of golf balls. To encourage the ladies to participate again, each of the non-winners was given a golf ball as a consolation prize.

Annual General Meeting

The chair at the annual meeting—which was held on the Saturday evening in the Golf Hotel—was taken by the president of the Society, Mr. J. Bell, who after welcoming members asked them first to stand in remembrance of Mr. Arthur Swain, an early and enthusiastic member of the Society who had died during the year. After apologies for absence had been read, Mr. R. C. Shepherd proposed that life membership of the IBF Golfing Society should be open to old members of the Society irrespective of whether or not they continued to be members of the Institute of British Foundrymen, and this measure was accepted by a unanimous vote.

In elections for office, Mr. J. Bell was again chosen as president on the proposition of Mr. E. A. Phillips, seconded by Mr. F. Webster; Mr. J. G. Phillips was re-elected as secretary; the vice-presidents and committee were re-elected *en bloc* with the addition of Mr. E. W. Pugh and Mr. P. B. Higgins to the latter. For next year's meeting, it was decided again to patronize Woodhall Spa, there being no other proposition put forward—this in part recognition of the excellent facilities provided by both the Golf Club and the Golf Hotel. The date of next year's meeting it was left to the committee to decide.

At this juncture, the prizes were presented by the president to the winners in the various competitions, and the meeting concluded by an expression of gratitude to the secretary, voiced on behalf of the assembly by Mr. Bell.

Annual Dinner

Following the annual general meeting, members and ladies reassembled for the annual dinner of the Society, followed by dancing, both held in the ballroom of the hotel. The proceedings were completely informal and there were no speeches. It was surprising to find that despite the strenuous exercise provided by 36 holes of golf earlier in the day, members found sufficient energy to really participate fully in the dancing and a good time was had by all.

Plastics Patterns

National Society of Master Patternmakers discuss Potentialities

About 40 members of the National Society of Master Patternmakers and guests were present at Charing Cross Hotel on Tuesday, September 22, to hear the paper "Introduction to Patternmaking in Plastics,"* given by Mr. H. G. C. King, of the Crewe locomotive works of British Railways. The meeting was under the chairmanship of Mr. B. Levy (who provided tea before the meeting began), supported by Mr. W. D. Hartley, the president of the Society.

The use of epoxy resins for the manufacture of foundry patterns has been developed during the last two years in the British Railways locomotive works' patternshop at Crewe, and Mr. King's paper was based on the experience and results obtained. As an introduction to his talk, Mr. King said that the use of plastics had increased with such outstanding success in both the patternshop and the foundries at Crewe that patternmaking in plastics was now a recognized method of manufacture. As a result of the research carried out into the use of this material, there were now over 1,000 plastic patterns in use on moulding machines of various types, and he hoped that his talk that evening would illustrate the advantages that had been found to accrue from this comparatively new practice.

Materials and Equipment

Mr. King then enumerated materials and equipment required for the manufacture of this type of pattern, saying that these were inexpensive and readily obtainable. A standard plastics casting-mix consisted, he said, of three main ingredients—epoxy resin, filler, and hardening agent. In addition, stocks of the following would be needed: thixotropic agent, fibreglass fabric, vermiculite and cork, plaster, sealing lacquer and release agent. Miscellaneous equipment needed to operate the process included: paint brushes from ½- to 1-in. in width, rubber roller (4-in. long by 1-in. dia. for use in impregnating the fibreglass), 3-in. palette knife, scissors, thermometer, modelling clay, cellophane, rubber gloves, barrier cream (ordinary barrier creams are unsuitable, but several firms manufacture special resin-resisting creams), solvents (acetone and methylated spirits), clean rag and cotton waste. These materials would cover the manufacture of any type of pattern, from the solid casting of small patterns to large patterns made by lamination.

Perhaps the most expensive item of equipment recommended was an oven and suitable heating element, but, for a normal range of patterns, this could be of simple design in the form of a metal cabinet, say, 4-ft. long by 2 ft. 6-in. wide and 2 ft. 6-in. deep, with adjustable shelves, and a heating element built into the base. Scales to weigh materials up to 14 lb. were also needed, as also were two metal drums (with taps) for the storage of hardener and resin. In addition, Mr. King recommended the use of ordinary ¼-, ½- and 1-gall. tins as mixing vessels.

Itemized Procedure

The lecturer then went on to describe the preparation of master patterns and followed with the production of moulds. Regarding the former, he said that split patterns of the type readily assembled to plates for machine moulding were particularly adaptable to manufacture in plastic. The master pattern could be of simple construction as it was fixed to a board during use. For example, the body, flange, and prints of the pipe patterns could be made separately and screwed together, which was simpler than the normal jointing adopted for a standard production type of pattern.

Passing on to details in the production of epoxy-resin duplicates from the master patterns, Mr. King said it was first necessary to prepare a plaster mould. In this, the face of the pattern which would be in contact with the moulding-machine plate was cast uppermost, and this needed to be thickened by ⅛ in. This was to provide sufficient material for machining, which was essential in order to ensure dimensional accuracy, and also to remove air bubbles from the plastic mix which would rise to the top face of the cast. To prepare it for investment in this plaster, the master pattern should be well coated with pattern enamel and then screwed to a board of ½-in. thick plywood, then a wooden frame built around it, a minimum space of ½ in. being left between the pattern and the frame. The next step was to coat the surface of the pattern and board with a creamed wax-polish to facilitate easy release from the plaster. The quantity of plaster required for a particular mould could be estimated by weighing the amount of water the frame would hold and using 75 per cent. of this amount. The addition of 1 lb. plaster to each 1 lb. water would be found to be sufficient to fill the mould and give a fairly thin pourable mix. After pouring the plaster into the mould, it should be vibrated to bring air bubbles to the surface. When the plaster was firm, surplus could be removed from the top of the frame and the complete mould turned over to stand on this face. The pattern, still secured to the board, could then be withdrawn.

Passing on to the final operation in the preparation of the mould to receive resin, Mr. King said this stage was most important. It was necessary to seal the surface of the plaster which would come into contact with the plastic material, and apply a release agent. Several coats of sealing lacquer were recommended and these could be applied by brush, allowing 30 min. for each to dry. Mr. King emphasized the importance of the thorough application of the sealing lacquer; unless this sealing was complete, plaster would adhere to the plastic cast and its removal would be a long and tedious job. A well-sealed mould would possess a glossy surface and should any dull patches be evident, a further covering of lacquer should be applied.

* Originally presented to the Institute of British Foundrymen.

Plastics Patterns

Finally, one coat of a creamed wax-polish should be applied over this sealed surface to form a release agent, and then the mould would be ready for use. During his lecture, Mr. King showed 25 slides to illustrate the manner of preparation of master patterns and the production of moulds, and he had also brought along about a dozen patterns of varying degrees of complexity, for members of his audience to examine.

At the end of Mr. King's talk, Mr. Levy introduced Mr. Hartley to members, and the president said a few words about the constitution and aims of the National Society of Master Patternmakers, commending Mr. Levy in getting together at that meeting such a representative gathering of London-area firms. Mr. Hartley appealed for new members and asked all present who were not members seriously to consider the advantages—numbers would add strength to the Society, he concluded. After Mr. Hartley's remarks, Mr. Levy then opened the meeting for discussion.

DISCUSSION

The first questions asked were: Whether a curing oven was really necessary; when applying the sealer to the plaster, could this be thinned and used as a swill; where could cork be bought, and what were the comparative costs relating to (1) solid-cast, and (2) laminated patterns. Replying to the first part of the question, Mr. King said the oven was not an essential part of the equipment. After gelation, however, the plastic was brittle and oven-curing overnight was a worthwhile precaution against breakage. Another member interjected to ask about plaster drying in an oven—wasn't this dangerous? The lecturer said that 160 to 180 deg. F. was the absolute maximum for plaster drying temperature and then there was little or no risk. Some plasters could be used " green," but subsequent stripping-off of the plaster from the pattern was not so easy. Referring back to the first speaker, Mr. King said that when making intricate-shaped patterns, the sealant could be thinned down and the excess swabbed or poured off. Three coats were needed. Mr. Levy interjected to say that ordinary shellac (button polish) could be used for this purpose. Mr. King next gave the name and address of a firm who could supply cork, and answering the last part of the first question, said that the cost of making patterns in plastic cost about 30 per cent. more than those made in wood, from existing masters. Another member said that with more-complicated patterns, nearer parity in cost was secured, and in his experience, even a saving was possible as compared with new wood patterns. The next question was whether it was necessary to face up and fix a backing plate for floor moulding, to which Mr. King replied that without backing the patterns wouldn't stand rapping, and really needed strut inserts as the plastic was not strong enough alone. In reply to a question as to what type of silicone release-agent was recommended, the lecturer gave a proprietary brand, but also said that almost any household silicone-wax polish could be used. As an alternative to a split-washer roller for impregnating the fibreglass, an ordinary door-spring could be used, one speaker commented. A questioner asked what was the final thickness built up when using reinforcement of 0.010 in. fibreglass, following investment of the mould contour with paste resin. Mr. King answered that the fibreglass was embedded in the existing paste, but that for greater strength in a shell pattern, mechanically bound matting reinforcement was a necessary addition.

Plated Patterns

In reply to a query as to whether, with solid patterns, the plastic could be poured through holes in what was in effect a patternplate, Mr. King said he could see no objection to this procedure. Mr. Levy added that in such a case, added mechanical keying or anchorage would be necessary and, naturally, the pattern would be undetachable from the plate. Here, a further speaker interjected the information that he had on occasion used an aluminium frame and produced single-sided patternplates (or even double-sided matchplate patterns) and these were then ready for immediate use on a moulding machine. Another member of the audience asked, of the examples on view, whether the colour was integral or were the samples painted, to which Mr. King answered that in some the colour was integral and others had been varnished. The best were now unpainted (with pigment in the resin), but in every case the standard of finish depended on the fineness of the plaster surface. The next question asked was what type of mechanical mixer was best, say for 10-lb. lots or more, for minimum air entrapment. To this, Mr. King replied that he thought hand mixing by the spatula was good enough. If a mechanical mixer was used, this had to be thoroughly cleaned each time—an awkward operation because of the risk of skin trouble amongst personnel. He next recommended one or two proprietary brands of barrier cream which had been developed for protection and resin removal from operators' hands, etc. In reply to a question as to whether plastic patterns could be altered, Mr. King said this was a relatively easy matter. Pattern parts could be cut off by bandsaw, for example, and replaced in a new position and the spaces built up and filed off. The final discussion concerned the use of " positive " models for producing negative plastic patterns or coreboxes direct and the various merits of plaster and wood when stripping from the plastic. Here, Mr. King said that wood patterns often tended to stick to the resin, plaster being very much easier to part from plastics. Wood patterns needed very careful sealing, however, positive models could on occasion be used for negative patterns or coreboxes.

Mr. E. C. Rowen, vice-president of the Society, in proposing a vote of thanks to Mr. King, said how much he had enjoyed his lecture, and congratulated him also on the able way he coped with members' questions. Mr. Levy seconded this, adding also his congratulations to Mr. King, for a most interesting contribution. (Mr. King was awarded the NSMP Levy Silver Medal for his work in connection with the making of plastic patterns.)

Correspondence

IRONFOUNDING INDUSTRY IN 1957

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I was most interested to read your summary of the ironfounding table in the census of production for 1955, 1956 and 1957 which appeared on page 137 of the September 10 issue of the FOUNDRY TRADE JOURNAL.

Perhaps more stress might have been laid upon the limited coverage of the census reports. For example the census relates to foundries which in 1957 employed an aggregate number of 105,453 employees. In that year the average employment for the whole ironfounding industry, as defined by the Iron and Steel Board, was in fact 138,100. The main reason for this difference is that the census defines the industry in such a way as to exclude a large proportion of the "tied" foundries.

In general, data drawn from the census, though not relating to the whole industry in the sense that it is defined by the Iron and Steel Board, can be used, as you have so well used it in your summary, to indicate the nature of change in the industry as a whole.

This, however, is not always so and on this occasion it appears that the census gives a different and lower indication of capital investment by the industry. Table I shows estimates of capital expenditure by the industry which are derived from a survey made by the Iron and Steel Board, while showing the parallel census statistics* in an adjacent column.

The Iron and Steel Board statistics below relate only to firms producing approximately 70 per cent. of the country's iron castings and thus are themselves low, yet the census statistics are noticeably lower. The census then, as far as investment statistics are concerned, would not appear to be catching in its net a true sample of the foundries covered by the Iron and Steel Board.

One other point occurs to me to require some qualification. While it is true that the census indicates a rise in the net output per person employed from £669 in 1951 to £894 in 1957, this rise is partly the result of the steep general rise in prices and wages over the period, though of course increasing productivity has played a part.—Yours, etc.,

PHILIP MOORE,
Economics and Statistics Officer.
Council of Ironfoundry Associations,
14, Pall Mall,
London, S.W.1.

* See page 76, "Development in the Iron and Steel Industry," Iron and Steel Board Special Report, 1957. H.M.S.O., price 4s. 6d.

TABLE 1.—*Capital Expenditure at Ironfoundries* (× £1,000).

	Census statistics.				Iron and Steel Board survey statistics.		
	New building work.	Plant and machinery.	Vehicles.	Total.	On productive capacity.	On welfare.	Total.
1955.. ..	1,572	3,723	662	5,957	6,250	750	7,000
1956.. ..	2,449	5,819	658	8,926	9,500	1,500	11,000
1957.. ..	2,374	6,270	618	9,262	14,000 (est.)	2,250 (est.)	16,250 (est.)

Fairbairn Lawson Combe Barbour Report

"Bare issue" of the figures without a detailed explanation could result in a false market in the company's shares, state the directors of Fairbairn Lawson Combe Barbour, Limited, Leeds textile machinery manufacturers. In order as far as possible to avoid this the issue of the accounts and report for the year to March 31, 1959, has been expedited.

The closing of the works of the Dundee subsidiary during the year, transfer of plant, machinery, stock, work-in-progress, etc., to Leeds, sales of some of the subsidiary's properties and plant, and considerable tax claims formulated, coupled with a change in depreciation following revaluation of fixed assets at the close of the preceding year, make the accounts somewhat complicated and not easy to compare with the previous year, except from the full accounts.

As far as can be compared, trading loss appears to have increased to £247,290 (£215,742), but the net debit is less than half at £63,534 (£156,039).

In the circumstances, it is stated, the directors cannot recommend any dividends.

In order to expand the business and to bring into the company's works new forms of products divorced from its traditional sales, Mr. W. Walker, the chairman, has been in discussion for some time with interested parties, and he hopes to make some announcement regarding progress by the time of the meeting, which is to be held at Leeds on October 22. The chairman says there is no major problem other than that of expanding and improving the order-book position.

Mechanical Handling Federation

Meetings of Section II (continuous conveying equipment) of the Fédération Européenne de la Manutention (European Mechanical Handling Federation) were held in Lucerne at the end of last month, on the occasion of the European Congress. Mr. F. S. Stent, of Great Britain, was in the chair.

The Section reported that work was now completed on the first edition of the "International Terminology" and that considerable headway had been made on the second edition of the dictionary. Work was also being done on the production of a European classification and symbolization of materials to be conveyed, and in addition the Section had been studying the possibility of seeking a modification of the universal decimal classification. In connection with the latter, it had been decided to ask the FEM as a body to create liaison with the Fédération Internationale de Documentation, at The Hague, as the subject was one likely to affect all Sections.

It was also stated that common ground had been established between the FEM and the International Standards Organization on the standardization of certain aspects of troughed-belt conveyors, and a formula for the standardization of certain components of gravity-roller conveyors was now being dealt with. Examination of safety regulations operated in various countries would be continued.

The next meetings of the Section will be held in Stockholm at the end of June, 1960.

Equipment and Supplies

Continuous-immersion Pyrometer Tube

The difficulties with pyrometer tubes for continuous immersion in molten metal are well known, and have often resulted in such pyrometry being abandoned in spite of its technical advantages. Morgan Crucible Company, Limited, Point Pleasant, London, S.W.18, have developed a plumbago tube (Salamander) which is intended to overcome these difficulties. In tests so far it has given very promising results in aluminium alloys, copper alloys and cast-iron (see Fig. 1). The new tube is claimed to have excellent resistance to thermal shock, good thermal conductivity, good resistance to slags and reasonable strength. It is supplied ready glazed to resist oxidation. It has been deliberately made short and stubby, to give good mechanical strength. The thick wall at slag level ensures long life, whilst the thin reduced end surrounding the actual thermocouple junction gives rapid response to temperature changes.

Thermocouple Protection

The use of a loose impervious inner-tube is essential when platinum thermocouples are used, and such an inner tube is also generally recommended when base-metal couples are employed. In the latter case, 14 or 16 s.w.g. nickel-base couples are recommended. If base-metal thermocouples are used without an inner tube, the thickest possible wire should be chosen, consistent with the ½-in. bore of the Salamander tube. The standard Morgan Crucible inner-tube is a Triangle Impervious aluminous-porcelain tube, 355 mm. long, 8 mm. outside dia. and 5 mm. bore. For temperatures above 1,350 deg. C., a similar Triangle Impervious Mullite tube is recommended. The tubes are very resistant to thermal shock, and can be plunged into molten metal without elaborate pre-heating, although

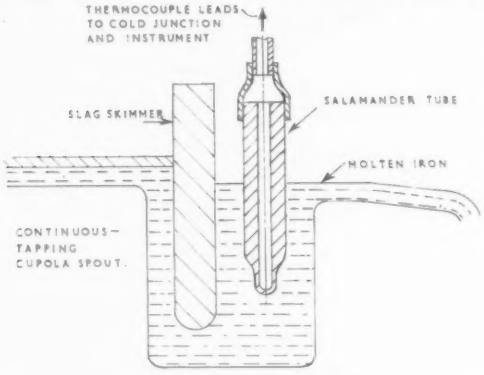


FIG. 1.—*Section drawing showing temperature control of a continuous-tapping cupola, using a Salamander tube developed by Morgan Crucible Company, Limited, of London.*

it is wise to make sure that the tubes are thoroughly dry and a least "hand warm." The response time when a cold tube (with inner-tube and platinum couple) is plunged into molten metal is approximately 2 min. to reach a true reading of 1,250 deg. C.

Extension

As indicated above, the tube is deliberately kept short to provide strength, and long tubes are not recommended. The minimum immersion depth is 4 in., the maximum 8 in. Above the melt surface a metal extension should be used, and the diameter of the Salamander tube has been chosen so as to cement directly into a 2-in. B.S.P. socket, using Battersea Cement No. 38. Normal practice is to use a 2 in./¼ in. or 2 in./½ in. B.S.P. reducing socket, and an extension of ordinary steel pipe having the thermocouple junction box at the cold end (see Fig. 2). This extension tube should preferably be straight, but can have a bend in it providing the radius is not very small. In applications where the metal extension tube reaches red heat for long periods, it must either be protected by external refractory sleeving or must be made of heat-resistant alloy. If external protection is necessary, the thermocouple will need a mechanical handling device.

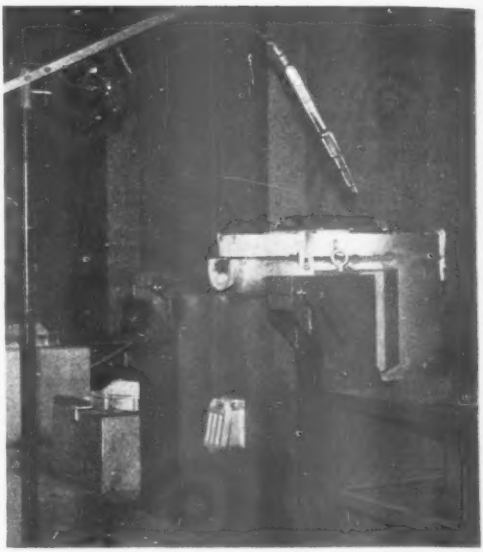


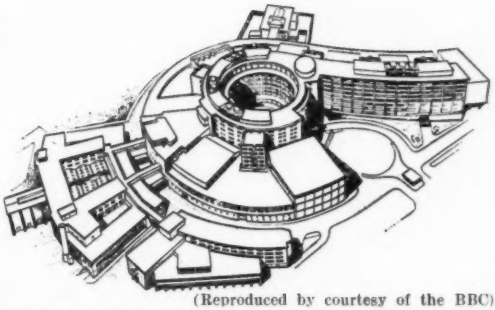
FIG. 2.—*Arrangement for intermittent temperature measurement in a crucible furnace, with (left) the pivot for the extension piece. The pivot stand may also be used to support degassing equipment.*

Applications

Morgan Crucible have prepared working data for the application of the new tubes to: crucible furnaces; reverberatory furnaces and cupola forehearths; cupola launders, and electric furnaces.

Dust-collector Servicing Scheme: Following a policy of after-sales service, Dallow Lambert & Company, Limited, of Thurmaston, Leicester, announce the introduction of a unit dust-collector servicing scheme, believed to be unique for this type of product. The scheme has been introduced to keep Dallow Lambert dust collectors in good condition and functioning efficiently. A fully-trained service engineer makes regular visits at six-monthly intervals, or at other dates mutually agreed.

Even the Television Centre needs Castings!



(Reproduced by courtesy of the BBC)

FIG. 1.—*Artist's 3-D impression of the new Television Centre being erected at White City for the British Broadcasting Corporation.*

An Elephant standing on one Leg provides a Strength Criterion

About 3,000 iron castings, making a total weight approaching 100 tons, will be embodied in the new BBC Television Centre (see sketch, Fig. 1) now nearing completion at White City, London. The vast majority of these will be frames and covers for spanning the hundreds of yards of ducts, carrying power input and output cables. At one location alone, over 2,600 frames and covers (made by Dover Engineering Works, Limited) have been needed for twin ducts 3-ft. deep, running around the whole basement perimeter (Fig. 2).

The Centre includes the provision of no fewer than five studios radiating from a central multi-storied block. The largest of these is 108 by 100 ft. by 54-ft. high, and one of them even accommodates a sizeable swimming pool, for aquatic displays. In these areas, some of the manhole covers and frames have been supplied by Broads Manufacturing Company, Limited. Asked how strong covers needed to be for this sort of duty, the guide who conducted the writer* on a tour of the building explained that in a TV studio it must be envisaged that a performing elephant might be required to stand on one leg; then, by chance, his foot might be placed squarely in the middle of a manhole cover. Thus, its weight was taken as a maximum load when designing covers to provide adequate strength.

FIG. 2.—*Part of the twin installation of* 2,600 *duct frames and covers in a circular basement corridor of the new BBC Television Centre. For this particular installation, the supply and installation contractor was Dover Engineering Works, Limited. All the covers and frames had to be tailor-made at the works to permit assembly on the site, with the use of a bare minimum of "specials."*

* The writer's thanks are recorded to the representative of Higgs & Hill, Limited, building contractors engaged on the BBC Centre, for conducting his tour. Permission from various authorities to publish these comments and illustrations is also acknowledged.

Borough Polytechnic Courses

The prospectus of part-time courses at the Borough Polytechnic, Borough Road, London, S.E.1, for the 1959-1960 session is now available. It details over 60 courses covering a particularly wide range of technological subjects. Amongst these enter foundry and fuel technology. For the former subject a four-year part-time day course is provided, covering the requirements of City and Guilds examinations. This course is well supported by a limited number of the London district foundries, but it merits the backing of many more, as the boys receive a sound training in the sciences underlying their craft.

Sandvik expands Research Facilities

Sandvik Steel Works Company, Limited, Sweden, have decided to expand their existing laboratory facilities by the construction, at an estimated cost of £265,000, of a new five-storey building which will adjoin the company's main steel laboratory. The new building, which is scheduled for completion in 1961, will increase the existing main laboratory floor space from about 32,000 sq. ft. to approximately 70,000 sq. ft. and will contain the most modern equipment available. At present some 250 scientists and technicians are engaged on research and development work at the main steel laboratory.

Company News

A sharp rise in group net income for the six months to June 30, 1959, compared with the corresponding period of 1958, is reported by IMPERIAL CHEMICAL INDUSTRIES, LIMITED. This year's figure is £20,227,000 (£13,591,000). The full year's net profit for 1958 was £23,855,000. The interim dividend is increased to 9d. (6.4d.) per £1 unit, the 1958 total being 1s. 7.2d. per unit. The half-year's sales advanced by £18,000,000 to £250,000,000, reflecting the net effect of an appreciable increase in volume and a reduction in selling prices.

The increase in volume of group sales is due mainly to the higher level of industrial activity in the UK, compared with 1958 and to a substantial increase in exports. Higher profits are attributable to lower unit costs of production arising from fuller utilization of manufacturing capacity and continuing improvements in technical efficiency. Sales volume and net profits for the first half of the year are more satisfactory, in relation to capital invested, than the disappointing results for 1958.

JOSIAH PARKES & SONS, LIMITED, hardware manufacturers and non-ferrous founders, etc., of Willenhall (Staffs)—The interim dividend is increased from 5 to 6 per cent.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED—The whole of the £75,000 5 per cent. "B" debenture stock, 1957-60, is to be redeemed at par on December 31, 1959.

MODERN ENGINEERING MACHINE TOOLS, LIMITED—The chairman, Mr. P. R. V. Wheeler, says that, provided current turnover and profit trends persist, he can predict with some confidence even better results in the current year.

WICKMAN, LIMITED, machine-tool and small tool specialists, of Coventry—The South African subsidiary has acquired more than 90 per cent. of the ordinary shares of D. Drury & Company, engineering suppliers, of Johannesburg.

POWER-GAS CORPORATION, LIMITED—The interim dividend for the year ending September 30 is 7½ per cent., payable October 27. Last year's interim of 5 per cent. was followed by a 10 per cent. final and a special interim of 5 per cent. in respect of the current year.

GEORGE WILSON GAS METERS, LIMITED—Replying to a question by a shareholder, the chairman, Mr. W. D. Wilson, said that the rate of loss for the second half of the year under review was substantially reduced by the company's policy of diversification and the introduction of new products. He viewed the company's future with optimism.

LE GRAND, SUTCLIFF & GELL, LIMITED, manufacturers of oilfield equipment, etc., of London, S.W.1—The offer by Stone-Platt Industries, Limited, to acquire all the company's preference shares for cash at 20s. per share has been accepted by holders of 95,570 shares, equivalent to 95.57 per cent. of the total, and has therefore become unconditional.

CROSSLEY BROS., LIMITED, makers of diesel locomotives, marine and gas engines, of Manchester—Group trading profit for the year to April 30 contracted to £344,306 (£445,217) and the net profit to £94,613 (£107,764). Adjustments to allow for over- and under-provision of tax show a drop in the balance of only £6,186. The dividend is maintained at 12 per cent. with an unchanged final of 9 per cent.

WILLIAM DOXFORD & SONS, LIMITED, shipbuilders, engineers, etc., of Sunderland—Group profits rose from £1,154,808 to £1,217,005 in the year ended June 30, 1959, and "in view of the high level of group profit," the directors recommend an increase of 5 per cent. in the final dividend to 25 per cent., making 30 (25) per cent. The directors, however, consider it unlikely that the level of profits will be maintained.

SOUTH DURHAM STEEL & IRON COMPANY, LIMITED—The directors announce that the Finance Corporation for Industry, pursuant to its agreement with the company, has elected to exercise its option to convert £2,000,000 nominal amount of its outstanding loan to the company into ordinary shares at par. The company accordingly issued 2,000,000 ordinary £1 shares on October 1. No Stock Exchange quotation is being sought at present for the new shares.

RANSOMES, SIMS & JEFFERIES, LIMITED, manufacturers of agricultural machinery, etc., of Ipswich—The rights offer of 500,000 ordinary shares of £1 each at 20s. per share has met with acceptances as to nearly 98 per cent. Applications were also received for approximately 382,000 excess shares and allotments in respect of these have been made on the basis that applications for up to eight shares have been allotted in full, and all other applications have been allotted eight shares.

WEBLEY & SCOTT, LIMITED, engineers and machinists, of Birmingham—Arusha Industries, Limited, announced last week that it had received over 80 per cent. acceptances and the offer for the company's ordinary shares would close on Tuesday, October 6. On behalf of the shareholders it is representing, Franco-British & General Trust has written to the board of Webley & Scott asking for answers to a number of questions arising mainly from the 1959 Webley & Scott accounts which were not available at the time of its previous letter.

M.L. HOLDINGS, LIMITED, grey-iron founders and general engineers, of Slough (Bucks)—Sir Noel Mobbs, chairman, says that present indications are that results for the current year will be no less satisfactory than those for the successful year to March 31, 1959. Orders for the group's specialized products remain at a high level, and, at the same time, the scope of the activities is widening, particularly in respect of general engineering work. Group net profit for 1958-59 rose to £97,589 (£76,653) and the total dividend of 25 per cent. is 5 per cent. more than the forecast given when the company was made public last November.

New Marketing Organization

Formation of a marketing organization between Stone-Platt Industries, Limited, which has more than 60 member companies, and the Carrier Corporation, Syracuse, New York, was announced in London on September 30. The new organization will be known as Carlyle Air Conditioning & Refrigeration, Limited, and it was stated that the operation of the organization would mean increased exports and more employment in Lancashire, Clydeside, and south-east London.

The organization, with offices in London, will market equipment manufactured by certain companies in the Stone-Platt group, under licence from Carrier International, a subsidiary of the Carrier Corporation.

A statement issued jointly by the Carrier Corporation and the Stone-Platt group said that the Corporation has a controlling interest in the new concern. The equipment marketed by Carlyle Air Conditioning & Refrigeration will be identical in basic design and performance to the corporation's equivalent products in the US, but detailed variation will be made.

Notes from the Branches

London

The first meeting of the 1959/60 session of the London branch of the Institute of British Foundrymen was held on Wednesday, September 23, at the Constitutional Club, Northumberland Avenue, London, W.C.2, when about 100 members and visitors were present. Mr. D. E. B. Barnard (the outgoing president) introduced Mr. J. Bain, the new president for the coming session, saying that Mr. Bain had many foundry associations and was very well qualified to occupy the chair, and that he took much pleasure in investing him with the badge of office. Mr. Bain acknowledged these kind remarks and said how much he was looking forward to his year of office as president, and asked Mr. Barnard to remain in the chair for the evening.

For his presidential talk, Mr. Bain described his recent trip to the Argentine and Brazil, when he covered about 16,000 miles, including about 4,000 miles of travel inside South America. He described the foundry, industrial and economic set-up in the countries visited, and compared these with conditions in this country. Mr. Bain's address was given in a most informal way and his audience were most enthusiastic about the way in which it had been given and also its interest. Before the proceedings continued, Mr. F. A. Wilson interjected a "thank you" to Mr. Bain.

Automatic Moulding

Next, Mr. Barnard introduced the lecturers for the evening and said how pleased he was to welcome Mr. P. Spear and Mr. R. D. Mills (of Rubery, Owen & Company, Limited) who had come along to talk about the "Development of an Automatic Moulding System."* Mr. Spear (director of research) described the development of the system for making small castings, from its first conception by an individual inventor working in a small way, its growth with a small partnership, the taking over by an industrial concern, and the further research and development carried out. Mr. Mills (manager, foundry-equipment department) next followed with a description of the plant as it stood to-day and enumerated the sort of applications for which it was being used. The plant was illustrated by slides, a short film, and a display of components.

In discussion, a member asked how the temperature of the sand was kept down. To this, Mr. Mills replied that the amount of sand stored in the system described was about three tons and it was turned over once per hour. So far, they had been making lighter types of castings, up to about 6 lb. in weight, and the sand did not get hot. The system, however, was quite flexible, and the sand-storage capacity might have to be increased. Mr. Spear also added that the moisture content of the sand was kept under observation. Automatic moisture content and sand temperature control had been considered, but were not thought worthwhile. A further questioner asked if the operation of the plant allowed sufficient freeze time for non-ferrous castings, to which Mr. Mills replied that non-ferrous castings had not been produced on the unit so far. There was a maximum period of five minutes allowed for cooling before the knock-out; if the castings to be produced would freeze in that time, they could be mass-produced on the unit. Only a few trials had as yet been made with non-ferrous castings, Mr. Spear added. Another member wanted to know what air pressure was required to operate the main squeeze, what was the volume of free air required by the plant and what was the mould hardness. Mr. Spear said free air at 80 cub. ft. per min. at 100 lb. per sq. in. was needed. Mould harness could be varied by the use of the static strickle bar. A further questioner wanted to know where the sand additions were made, to which Mr. Mills replied that these could be carried out conveniently at the knock-out, the additions were made manually and the mill was manually controlled. Questioned as to the reason for adopting malleable-iron moulding boxes, Mr. Mills said it was not possible to get a suitable steel box at a reasonable cost. Grey-iron had been tried but this material easily broke and they had found that a malleable cast-iron box stood up well to the conditions required.

Asked how molten metal supplies varying in amount were arranged, Mr. Mills explained that it was obviously necessary to have a continuous and flexible supply of metal; for this a cupolette could be used in conjunction with ordinary cupolas. Mr. Spear said that the metal demand might vary around 4 tons per hour (plus or minus 2 tons per hour) and the precautions taken to balance metal production were those which were normal in foundries. Another speaker pointed to the value of the syphon-brick tapping arrangement for the cupola, making it possible to melt anything from 1 to 5 tons per hour. A further member pointed out that if there were two patterns on the machine, presumably four different volumes of sand would be required. Mr. Spear answered that this was a valid criticism of the machine, but broadly speaking, patterns were selected which paired up fairly well. Another member wanted to know why the knock-out operation was not made automatic. Mr. Spear explained that an automatic device was being developed and a design was already partly completed. The speaker stressed that he meant "fully automatic," to which Mr. Spear replied that he did not think this would be a really economic proposition, for there had to be a man at the knock-out in any event.

This concluded the discussion and Mr. D. A. C. Hutchison proposed a vote of thanks on behalf of the branch to the president for his address and to the lecturers. He said how much he admired the way Mr. Spear and Mr. Mills had answered the questions and for the able way they had put across their lecture—it was done with professional brilliance. Mr. J. P. P. Jones seconded and added that hitherto this country had been backward in developing new devices for the foundry industry.

South Africa

A very interesting programme of events is listed in the July to December syllabus published by the South African branch. In addition to the monthly meetings, there was a works visit in August to the National Motor Assemblies (Pty.), Limited, last month the branch held a social evening and a problems evening, there is to be another works visit this month and the branch dance will be held in December. Of the papers, two—"Pyrometry, the Science of High-temperature Measurement" by Mr. F. P. A. Robinson, and "Foundry Sand-testing and Casting Defects" by Dr. P. H. Riley—have already been reported in the JOURNAL. This month the lecturer will be Mr. A. Cluett on "Malleable Cast Iron" and the November lecture will be by Mr. J. H. Martin on "Electric-arc Melting Practice."

The bi-monthly programme of the newly-formed Natal section includes a social evening, a lecture on "Moulding a Massive Monument" by J. Steele, and the first annual dinner of the section in November.

* An account of this system was published in this JOURNAL, August 20, p. 45.

News in Brief

THE DERBY BRANCH OFFICE of United Dominions Trust, Limited, is being moved to new premises, and as from October 12 the address will be Martin's Bank Chambers, Market Place, Derby.

ABOUT 80 WORKERS in the Birmid group of companies were last weekend presented with long-service awards at the works of the Birmingham Aluminium Casting (1903) Company, Limited, at Smethwick. There are now 1,370 employees in the group with 25 or more years' service.

THE SIXTH REGIONAL OFFICE of the British Institute of Management which has been opened in Bristol at St. Giles House, Quay Street, is to be the headquarters of the South Wales and West of England Regional Council of BIM. The new regional manager is Mr. I. D. Cunningham.

MILLSPAUGH, LIMITED, the Sheffield pulp- and paper-machinery builders, have agreed a contract with Poland worth hundreds of thousands of pounds for the manufacture of cellulose wadding. A subsidiary of Hadfields, Limited, steel makers, Millspaugh, are negotiating further important contracts with Poland.

LORD RIVERDALE opened, on October 1, a careers exhibition organized by the Sheffield Junior Chamber of Commerce and the Sheffield Youth Employment Bureau, and held at the Edmund Road Drill Hall, Sheffield. It was attended by 1,200 pupils and exhibits included models of machinery and examples of work of different industries.

A STUDY CONFERENCE of foundry technician training is being held under the auspices of the Council of Ironfoundry Associations at the Worcestershire Brine Baths Hotel, Droitwich, on November 11 and 12. Executives interested in this subject and who would like to attend the conference should write to Mr. F. C. Hayes, the training officer at 14, Pall Mall, London, S.W.1.

THE WEST RIDING and North Derbyshire area training committee of the British Iron and Steel Federation are to make an analysis of the jobs done by foremen. The committee's report states, "It is hoped that this initial work on analysis of foremen's jobs will produce a useful lead in establishing a more satisfactory basis for selection and training of foremen than can be achieved at present."

Mr. DAVID EDWARD ALLEN, who is now on the staff of the Brown-Firth Research Laboratories, is the first student of the Sheffield College of Technology to win a technical State scholarship. Aged 22, Mr. Allen has been a student in the science department since September, 1953. Last year he was awarded the ordinary national certificate in metallurgy, with distinctions in chemistry and physics.

THE WOLVERHAMPTON BRANCH of the Amalgamated Union of Foundry Workers held a dinner on September 26 to mark the 150th anniversary of the foundation of the Union. Among the guests were the Mayor of Wolverhampton, Alderman Norman Bagley, members of Wolverhampton Town Council and the district secretary and organizer of the Union of Foundry Workers, Mr. G. Greenhouse.

THE 50 MEMBERS of the Swedish Excavator Owners' Association who visited Newton Chambers & Company, Limited, Chapeltown, on September 29, were told by Mr. S. L. Waide, executive director of the chemical division of the firm, that the new "Outer-Seven" agreement meant that Britain and Sweden were "standing on the brink of new and exciting possibilities," and that the "new agreement may be the forerunner of free trade."

AN EXTENSION to the factory of Electropol Processing, Limited (commercial electropolishers of stainless and other metals) at the Farnham Trading Estate, Surrey, will treble its present capacity. This is the fourth extension since 1952 when the firm moved from a Nissen hut opposite Bourne Mill (of Domesday Book fame) at Farnham seven years ago. The new extension is of 13,000 sq. ft. area and was designed and constructed in pre-cast concrete by Hewitts of Cranleigh.

Mr. W. J. MCBRIDE, a director of Edgar Allen & Company, Limited, and head of the engineering division, recently attended the official opening, by the Shah of Persia, of the Doroud cement plant ordered by the Seven-Year-Plan Organization of Iran. The plant will produce daily 600 tons of portland cement. Equipment supplied by Edgar Allen includes 2 rotary kilns, a primary crusher, wash mills, and tube mills for raw and finished materials, together with all ancillary equipment.

A CONSIDERABLE DECREASE in unemployment in Sheffield is shown in a recent report. A total of 2,900 people—2,262 men and 638 women—were unemployed on September 14, and 255 were working short-time. The total in these two categories, 3,155, represents 1.15 per cent. of the city's insured population. This compares with the previous month's percentage of 1.24 and is half of the September, 1958 percentage of 2.3. A year ago there were about 6,000 workers on short-time, and these now number less than 700.

FOLLOWING THE SUCCESS of last year's Rayburn Window Display Competition, Allied Ironfounders, Limited, have again organized a similar contest, and this year (entries had to be received before October 5) there was a choice of three themes for the displays. The winner of the first prize will have the choice of either a Golden Shark 16½-ft. cabin cruiser, or £500, or the professional services of a window-display consultant for a period of six months. A second prize of £200, a third of £100, and 20 prizes of £10 each will be awarded to the runners-up.

HEAD WRIGHTSON IRON AND STEELWORKS ENGINEERING, LIMITED, a subsidiary of Head Wrightson & Company, Limited, are to supply an additional sintering plant to the Aviles Works of Empresa Nacional Siderurgica SA, the Spanish national steel company. The new plant will form an extension to the existing sinter plant and is designed to produce an additional 10,000 tons of blast-furnace sinter a week. Total value of the equipment to be supplied is approx. £500,000. Manufacture is well in hand and delivery is expected to be complete by January, 1960.

ONE OF THE LARGEST electric heat-treatment furnaces in this country is to be built by Birlec, Limited, for the English Steel Company Limited, Sheffield, at a cost exceeding £65,000. The furnace is of the pit type with effective internal dimensions 35 ft. deep by 8 ft. dia., and a rating of 1,220 kw. It is to be used for the heat-treatment of alloy-steel forgings up to 100 tons in weight, and special features will include a control system to ensure very close temperature tolerances and provision for controlling the composition of the furnace atmosphere. This is the latest of several large Birlec furnaces used by this company for the treatment of heavy forgings, including one 60 ft. deep by 12 ft. dia.

THIRTY SENIOR EXECUTIVES from more than a dozen UK factories in the David Brown group of engineering companies took part in a management conference at the Old Swan Hotel, Harrogate, last weekend. The

objective of the conference, a new venture by the David Brown organization, was to bring all general and divisional managers together to discuss some of the broader aspects of current and potential industrial problems. Subjects covered included "The Problems facing Great Britain in her World Position"; "Trends in the Trade Union Movement"; "Management and Labour Relations"; and "Problems and Prospects of British Export Trade." The conference began on Friday evening and ended on Sunday afternoon.

THE INAUGURATION of the newly-formed Heavy Organic Chemicals Group of the Society of Chemical Industry will take place at a meeting of the Society to be held at 14, Belgrave Square, London, S.W.1, on November 12. The chairman of the new group is Dr. R. Holroyd; Dr. M. A. Matthews is deputy chairman and the hon. secretary is Mr. H. P. Hodge. The inaugural lecture entitled "Production of Bulk Organic Chemicals" will be given by Mr. D. G. Smith at 6 p.m. The Society also announces that Dr. W. M. Hampton, O.B.E., will deliver the fifth Chance Memorial Lecture under the title "Development of Furnaces for Glass Melting" on Tuesday, February 9, 1960, in Birmingham. Non-members will be welcome at both meetings.

LONDON'S STREETS are to be cleared of 24,000 poles that carry the overhead tracks of London Transport Executive's trolley-buses. The contract for their removal has been awarded to George Cohen Sons & Company, Limited, the company that is already engaged on scrapping 1,400 of the Executive's trolley-buses. Residents along the routes need not fear noise as cranes remove the poles from the six feet of concrete in which each is anchored. The firm's dismantling department have developed a system for doing much of the job in silence. First, the poles will be cut through just above ground level. Next, hydraulic pressure will be used to distort the base of the pole below ground and, by so doing, to crack the concrete surrounding it. Thus freed, the stumps can be withdrawn smoothly, without digging, without noise and, above all, without risk of damage to nearby telephone cables and other services.

Obituary

The death has occurred at the age of 57 of Mr. GEORGE WOOD, manager of the maintenance and machine department of Clay Cross (Iron Foundries), Limited. He had been with the company for 44 years.

Mr. WILLIAM HALL, former foundry manager at the Ecclesfield works of the Brightside Foundry and Engineering Company, Limited, died in Sheffield on October 1 at the age of 74. He served the company for more than 36 years, and retired six years ago.

The death occurred last month of Mr. JOHN JACKSON, works manager and a director of Matterson, Limited, machine-tool and crane manufacturers, Shawclough, Rochdale. Aged 47, Mr. Jackson joined the firm as an apprentice when he was 16 and was appointed works manager in his early twenties. He became a director three years ago.

Mr. BASIL WILSON DONCASTER, chairman of Daniel Doncaster and Sons, Limited, Penistone Road, Sheffield, from 1948 to 1955, died on September 29 at the age of 74. He joined the firm, which was founded by his great grandfather, in 1906, and was a director from 1909 until his retirement in 1955. He was a Freeman of the Cutlers' Company, and formerly represented the Crucible Steelmakers' Association on the Council of Sheffield Chamber of Commerce.

Foundry Furnishings

Hark! I hear the Foundry Foreman,
Bellow to the Foundry Storeman,
What have you inside that door man?
HOOKER'S goods I hope!

Why not take a look man,
In my Order Book man?
Hammers, rammers, Die Slick pails,
Wood flour, forks and foundry nails,
Chisels, chaplets, straw in bales,
From HOOKER'S Foundry Store.

Said the Storeman to the Foreman,
We have HOOKER'S goods galore man,
Nothing else goes in that door man,
While I'm in the Store.

Yes, we've all that matters,
Even foundry ratters,
If you've pestilential rats
Try HOOKER'S brand of ratting cats
And keep the news beneath your hats,
Future stocks assured.

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Personal

Retirement of Mr. F. Arnold Wilson

From to-day's date, the retirement is announced of Mr. F. Arnold Wilson, manager of the home pig-iron department of Wm. Jacks & Company, Limited, a great nephew of Dr. William Jacks, the founder of the firm, which he joined in 1919. Educated at Glasgow Academy, Sedburgh School and Christ's College, Cambridge, Mr. Wilson served in the 5th Battalion Cameronians during the 1914/18 war and was mentioned in despatches and awarded the Mons Star. After the war, he spent a short time with Pease and Partners and travelled widely on the Continent, USA and Canada, visiting foundries and steelworks before, in 1937, being promoted to his present position with William Jacks. Mr. Wilson has been a member of the Institute of British Foundrymen since 1936, and was honorary secretary of the London branch for many years, presiding over that branch in 1947/48; he has been a member of the IBF national Council and its finance committee for about 20 years. Mr. Wilson has been a Liveryman and Freeman of the Worshipful Company of Founders since 1948. He has also served on many other foundry industry committees, among them the Pig Iron Merchants Association, Foundry Coke Merchants Association, National Federation of Iron and Steel Merchants and is a member of the Iron & Steel Institute. After retirement, Mr. Wilson is to continue with William Jacks in a consultative capacity.

Mr. E. N. EGAN has retired from the board of Folland Aircraft, Limited.

Mr. S. A. ROBERTS has been appointed managing director of B.S.A. Tools, Limited.

Mr. C. R. CURTIS has resigned from the board of A.B.C. Coupler and Engineering Company, Limited.

Mr. G. R. GILES and Mr. H. S. HULL have been appointed directors of the British General Electric Company Pty., South Africa.

Mr. E. P. PURCELL has been appointed to the board of George Cohen (Dublin), Limited, a member of the George Cohen 600 Group.

Dr. F. A. TATFORD, director of contracts, U.K. Atomic Energy Authority, has been elected president of the Institute of Public Supplies Officers.

Mr. A. E. BELL has been appointed commercial manager of Distington Engineering Company, Limited, a branch of the United Steel Companies, Limited.

Mr. GEORGE HEYWOOD, general manager of John Hall and Son (Oldham), Limited, ironfounders and engineers, has been appointed a director of the company.

Mr. A. MOORE has been appointed area technical representative for Brayshaw Furnaces, Limited, Belle Vue Works, West Gorton, Manchester, for the North and East Midland areas.

To-day in the national Parliamentary elections, Sir FRANK MARKHAM, a director of Foundry Equipment, Limited, is defending his seat as M.P. for the North Buckinghamshire constituency.

Mr. MALCOLM J. CRAWFORD, managing director of the Wayne Tank and Pump Company, Limited, Bracknell, Berks, has been appointed chairman of the company in succession to the late Mr. WILLIAM H. GIBSON.

Mr. D. C. H. MCLEAN has been appointed managing director of the Lamson Engineering Company, Limited. He succeeds Mr. R. L. HERRING, who has resigned the managing directorship for reasons of health but retains his seat on the board.

Mr. F. V. THOMPSON has been appointed director of personnel of British Insulated Callender's Cables, Limited. He relinquishes the position of secretary and manager (personnel). Mr. J. P. HOURSTON has been appointed secretary, and is succeeded as assistant secretary by Mr. G. V. TEW.

Mr. DOUGLAS SHARP and Mr. GRAHAM DONALD have retired from executive management of Scottish Machine Tool Corporation, Limited. Mr. Sharp, however, continues as chairman and Mr. Donald retains his seat on the board. Mr. A. BENNIE has been appointed sales manager.

Mr. A. K. MCCOSH and Mr. H. C. WATERSTON, chairman and vice-chairman respectively, of William Baird & Company, Limited, and of Bairds & Scottish Steel, Limited, have relinquished their appointments for reasons of health. Mr. McCosh will, however, retain his seat on the board of William Baird & Company.

Mr. FRANK LEONARD, superintendent of the factory of Peglers, Limited, brassfounders, Doncaster, has left for South Africa to become works manager for Peglers in that country. Mr. Leonard who has been with the company since he left school in 1922, was presented with a gift from his colleagues before leaving for South Africa.

Mr. ERIC JOYCE, managing director of Oakes Turner and Company, Limited, gold and silver refiners and bullion dealers, 75, Eyre Street, Sheffield, has retired from that post, but remains a consulting director. A presentation was made to him on behalf of the employees by Mr. H. R. LOVELL, who succeeds him as managing director.

Mr. WILLIAM BROADBENT retired last week as managing director of Robert Broadbent & Son, Limited, ironfounders and manufacturers of quarry machinery, etc., of Stalybridge (Ches), after 68 years with the company. Mr. M. H. APPLEGATE has been appointed general manager and Mr. NORMAN BROADBENT will continue to serve the company as technical director.

Mr. T. G. EDMONDSON has been selected as a technical officer of the Combustion Engineering Association in succession to Mr. ANDREW LAIRD who has relinquished this post to take up another appointment. Mr. Edmondson was educated at Wellington College and N.W. Kent College of Technology. After a period of training with Humber, Limited, he served with J. & E. Hall, Limited, and later with Todd Oil Burners, Limited.

The retirement is announced of Mr. C. SHAW who, for 46 years, was manager of the traffic department of Edgar Allen & Company, Limited, Sheffield. After service in the first world war, he organized the company's traffic department, taking charge of the internal transport of the company in 1937. He served on the Sheffield Chamber of Commerce for approximately 35 years, and on the transport committee of the National Federation of Iron and Steel Manufacturers for nearly 30 years.

Recent Wills

LEWIS, G. L., managing director of George Lewis & Son, Limited, agricultural engineers and merchants, of Kettering (Northants) £39,134

MACHARG, SIR ANDREW SIMPSON, chairman of A. & J. Main & Company, Limited, and a director of the North British Locomotive Company, Limited, Bairds & Dalmellington, Limited, Gourock Ropework Company, Limited, and other companies ... £167,380

Electrical Aids in Industry *Data Sheet* **No. 7**

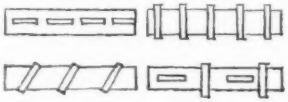
Lighting-2

The general principles of factory lighting have been dealt with in the previous data sheet (No. 6). This one considers briefly certain factors—not always fully appreciated — that influence the lighting for some particular factory applications. The next data sheet will carry the subject further.

Work benches

The most universal application of lighting is to bench work, for there is no branch of manufacturing that does not have its work benches which, of necessity, are used for a great variety of occupations. No single lighting method is suitable for all cases.

The introduction of fluorescent lighting has gone a long way to solving one of the main problems here; for while the high degree of brightness of filament lamps tends to preclude their use for individual lighting owing to the glare, the fluorescent tube with its greater expanse of light source has made localised lighting with a low mounting height more practicable. Moreover, the length of the fluorescent tube makes it possible to control shadows.



With narrow individual benches (not more than 4 ft. wide), there are four basic methods of localised lighting: longitudinal, transverse, diagonal or a combination of longitudinal and transverse. With wider benches it is not advisable to use fittings directly over benches, and fittings should be behind the workers at each edge of the bench. Where particularly high illumination is required, fluorescent fittings may be mounted as local lights — low enough for the skirt of the reflector to conceal the lamps from the eye of the operator.

High-bay shops

Probably the most difficult of all factory lighting problems is that of high-bay lighting. In lofty, long and sometimes necessarily dirty shops such as those which house really large machine tools and overhead cranes, it requires great ingenuity, coupled frequently with high lamp wattage, to provide adequate illumination. From the planer operator to the slinger, the workman is dependent on good lighting if he is to avoid an over-cut or a serious crane mishap.

The major problems associated with the lighting of high and relatively narrow shops, such as heavy machine shops, are:

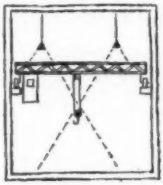
(a) Poor light utilisation caused by excessive light absorption by the large and often dark wall area.

(b) Preponderance of light flux downwards and poor cross lighting causing poor illumination on vertical surfaces, and heavy shadows.

(c) Possibility of heavy light absorption in the atmosphere.

(d) Difficulty of access to high fittings for maintenance.

In high-bay workshops there is a tendency to use concentrating fittings so that the maximum proportion of the light output reaches the working area without spread to the walls, but the saving in wall absorption is obtained only by accepting a depressing environment, poor cross lighting and heavy shadows.



In many cases it is good practice to accept the inevitable reduction in light utilisation by wall absorption and to reduce this by applying light colours to interior surfaces where possible throughout. This approach results in more cheerful conditions and provides equally good illumination values and better cross lighting. Even better is to add angled lighting from the sides below crane level.

In this type of shop, rapid deterioration in light source intensity due to dust must be expected. Facilities should always be provided for easy access to fittings for cleaning and maintenance.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available — "Lighting in Industry" is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity, including one on industrial lighting. Ask for a catalogue.

7931-4

CUT HERE

Raw Material Markets

Iron and Steel

There is very little, if any, change in the pattern of business among the ironfoundries, and the production of castings follows closely on the lines which have ruled for some time. Fortunately for the makers of high-duty castings, demands have been maintained at appreciable levels for quite a long time, particularly from the motor vehicle trade, and the foundries catering for this trade have been able to obtain good outputs.

Many of the engineering and speciality foundries supplying high-duty castings to other users have been less fortunate; business has been on a fluctuating basis, particularly in the case of the machine-tool industry, heavy engineering, steelworks, collieries, and railways. The demand for castings from the machine-tool trade is now showing some improvement and the same is true of the call from the steelworks. From the collieries and railways, however, demands are still only moderate.

Many of the light-castings foundries continue to do better following a long period of slackness, but there is still room for improvement, plants generally working well below capacity levels. The jobbing foundries maintain a fair rate of employment, but could undertake more work, as could also the textile foundries. The demand from these foundries for high-phosphorus pig-iron shows little expansion. Orders placed are confined mainly to those tonnages required for current consumption and the maintenance of a small working stock.

The engineering and speciality foundries maintain a brisk demand for low-phosphorus iron; adequate supplies are available. There is also a fairly good call for hematite, but not sufficient to absorb current outputs and the fairly appreciable stocks held by the furnaces. Refined irons are plentiful.

The foundries are able to obtain without difficulty their scrap requirements, apart from the better qualities of cast-iron scrap such as cylinder blocks, although recently there has been some improvement in the quantities arising of this grade. Foundry coke deliveries are satisfactory. Ganister, limestone, and firebricks are available to requirements.

Business at the re-rollers is maintained and outputs of all their products are now on a much improved scale. Good demands continue for small bars and light sections, and the mills supplying reinforcing rods are very busy. Deliveries of steel semis from home steelworks are generally meeting requirements, but the demand is now much heavier, with the result that suppliers are fully committed for their outputs for some time ahead. There is also a brisk demand for suitable defectives and crops as they arise.

Non-ferrous Metals

A strike at the El Teniente mine in Chile and a US dock strike, which were only possibilities last Thursday, have become realities. Indeed, negotiations collapsed at Braden's El Teniente mine and the strike started on Friday, the same day the US dock strike became effective. The present position is clear, if depressing. Strikes in the US encompass the copper industry, the steel industry, and the ports on the east coast. In addition, there is the strike at El Teniente and a deal of unrest in the Belgian Congo which could conceivably tie up that country's copper production. The first organized strike in the country's history started at the beginning of this week. In these circumstances, the London quotation has surged ahead and looks like going higher. However, the net effect of all these strikes is difficult to analyse. Stocks of copper are obviously dwindling rapidly. But the steel strike is becoming so serious that demand is falling away. Moreover, the strike of the dockers in all Atlantic and Gulf ports virtually insulates the US from receiving supplies from the UK, which will prevent the London quotation from going ahead too fast.

The position and prospects for a settlement of the strikes is also difficult to assess. There is no sign as yet of the copper industry coming to terms, but hopes are high that the strike at the El Teniente mine will soon be resolved. All in all, these strikes have made about 1,000,000 US workers idle. The US quotations remain unchanged, with custom smelters (there is only one major smelter in operation) quoting 33 cents only for December/January copper and producers 31½ cents a pound.

In London the market is firm and the statement has been made that much of the Board of Trade stocks, which totalled 30,000 tons, have been sold. If so, London prices will be forced up faster than they otherwise would have been without this shock absorber in the background. Copper stocks in LME warehouses at the end of last week totalled 13,063 tons, a drop of 175 tons on the week.

Tin is firm again despite the fact that the Eastern quotation has not yet fully recovered its former buoyancy. Continental and US demand are satisfactory and, it is said that the buffer stock manager has been in the market again to keep prices from going too high. Nevertheless, the LME quotation is now at its highest since February, 1957, and the prospects of a settlement in the US steel industry and the consequent rise in demand for tinplate, which, it is believed, would result is keeping this market very firm. In the US the price is now above $1.03 a pound. Tin stocks in LME warehouses at the end of last week declined by 256 tons to 8,338 tons.

Lead still remains the weakest of all the non-ferrous metals but, even so, the London price has climbed above £70 a ton and there are many who believe the quotation will go higher in the weeks ahead. How high it will go is probably determined by the scrap market, which functions to its own advantage at around £75 a ton. In the US the market is lifeless and the price is 13 cents a pound.

Zinc is a good market and the price has more than recovered last week's losses. Demand is satisfactory, nearby metal is still hard to find, and hopes of the steel strike being settled makes for a very firm undertone. In the US the price is 12 cents a pound.

George Kent's Conference

A four-day technical and marketing conference was held by George Kent Limited, at Luton, in the week beginning September 28 under the chairmanship of Commander P. W. Kent, R.N. Discussions were preceded by a review of company policy; also dealt with were future plans in relation to the company's range of industrial instruments, meters and automatic controllers in home and export markets. Attending the Conference were members of the firm's world sales organizations in seventeen foreign countries in addition to UK area representatives, the board of directors of the parent company, and senior research, development, production, service and sales engineers.

Mr. J. I. YATES has left the board of Radiation, Limited.

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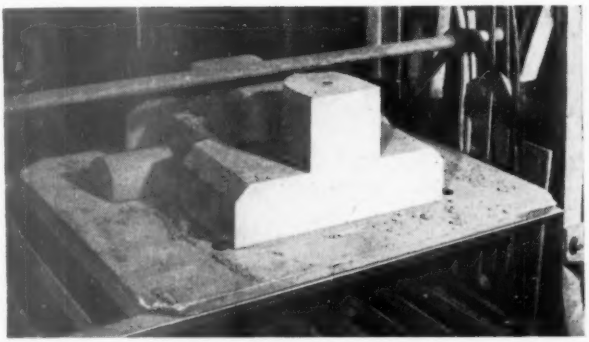

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Current Prices of Iron, Steel, and Non-ferrous Metals

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October 7, 1959

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £24 14s. 0d.; Scotland (Scotch iron), Zone S.1, £25 0s. 6d.; Sheffield, £26 2s. 6d.; Birmingham, £26 9s. 0d.; Wales (Welsh iron), £24 14s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire, in 10-ton lots or over.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £40 0s. 0d. to £42 10s. 0d., scale 15s. 0d. per unit, lumpy; 75 per cent. Si, £54 0s. 0d. to £57 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 10s. 9d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 13s. 9d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy). —4/6 per cent. C, £77 0s. 0d. to £81 0s. 0d., basis 60 per cent., Cr, scale 26s. 0d. to 27s. 6d. per unit; over 6 per cent. C, £74 10s. 0d. to £77 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; 2 per cent. C,* 1s. 7½d. to 1s. 10½d. per lb. Cr.; 1 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 9d. to 2s. 0d. per lb. Cr; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 9¾d. to 2s. 0¾d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £245 0s. 0d.; 96/98 per cent., £275 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £66 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons. £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections (under 10 tons).—Ship plates, (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 4s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 4s. 0d.; nickel-chrome-molybdenum, £111 17s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £233 15s. 0d. to £234 0s. 0d.; three months, £233 5s. 0d. to £233 10s. 0d.; settlement, £234 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 3½d. per lb.; rods, 250s. 6d. per cwt. basis; 20 s.w.g., 285s. 6d. per cwt.

Tin.—Cash, £794 0s. 0d. to £794 10s. 0d.; three months, £794 10s. 0d. to £795 0s. 0d.; settlement, £794 10s. 0d.

Lead (Refined Pig).—First half October, £70 0s. 0d. to £70 2s. 6d.; first half January, £71 2s. 6d. to £71 5s. 0d.

Zinc.—First half October, £87 0s. 0d. to £87 5s. 0d.; first half January, £85 5s. 0d. to £85 10s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £122 5s. 0d.; rolled zinc (boiler plates), all English destinations, £120 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £99 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10¾d. per lb.; sheets to 10 w.g., 202s. 9d. per cwt.; wire, 2s. 8¾d.; rolled metal, 202s. 9d. per cwt.

Brass (Brazing).—BS1400, B3, £154; B6, £202.

Brass (High Tensile).—BS1400, HTB1, £187; HTB2, £203; HTB3, £217.

Gunmetal.—BS1400, LG2, £193; LG3, £203; G1, 1½%, £253; G1, 1%, £242.

Phosphor Bronze.—BS1400, PB1 (AID released), £290; BS1400, 90/10/1, £268.

Leaded Phosphor Bronze.—BS1400, LPB1, £213.

Phosphor Bronze Strip, etc.—Strip, 290s. 3d. per cwt.; wire, 4s. 1d. per lb.; rods, 3s. 4¼d.; tubes, 3s. 4¼d.; chill cast bars: solids 3s. 4d.; cored 3s. 5d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £71 10s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £240; AB2, £250.

* Average 68–70 per cent.

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American Letter

Potentialities of Sodium-silicate-bonded Sand*

It was decided to try to find out (*a*) whether or not sodium-silicate-bonded sands could be reclaimed, and (*b*) what could be expected in the way of dimensional accuracy from a sodium-silicate-bonded sand-mould. If this kind of sand had to be discarded after each cast, then sodium silicate as a bonding agent could well become completely uneconomic.

First Experiment

The casting chosen for the experiment (*a*) was a Steel Founders' Society of America standard test-block (see Fig. 1). The first sand mix contained 6-per cent. sodium silicate and 2-per cent. kaolin clay. An excellent casting resulted, but shake-out proved extremely difficult. The sodium silicate content was then lowered to 4 per cent. The castings from this sand mix were not 100-per cent. defect-free, but were good enough to be used for comparison with castings made from the same sand after reclamation. The 4-per cent. sodium silicate sand was then reclaimed in two different ways:

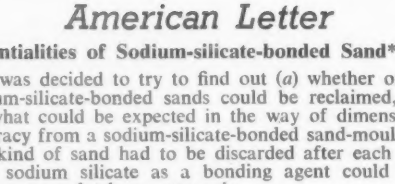

FIG. 1.—*Test casting used in sodium-silicate-bonded sand experiment (a).*

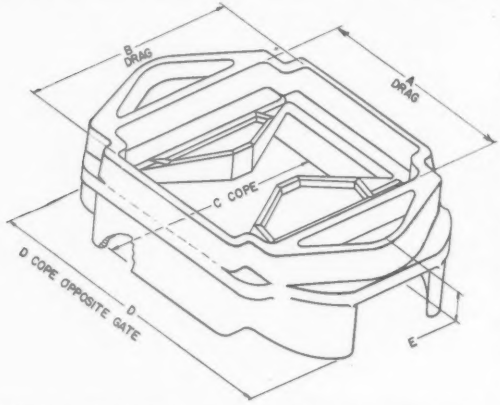

FIG. 2.—*Test casting used in dimensional accuracy experiment (b). Measurements were taken at five points, A to E.*

(1) In a pneumatic scrubber, and (2) in an aerated muller. Twenty per cent. of new sand was added to each batch of reclaimed sand, reclamation by the pneumatic scrubber being done at the rate of 1,000 lb. per hr. in a two-compartment unit. Castings made after the fifth reclamation proved to be similar in appearance to the original new-sand castings. Similarly, the sand reclaimed by using an aerated muller produced castings of a similar surface appearance to the original castings, also after the fifth reclamation. It was concluded that sodium-silicate-bonded sands may be successfully reclaimed, using an aerated muller or pneumatic scrubber. However, it was also discovered that the sand must be physically crushed after shake-out to get the best results.

Second Experiment

Experiment (*b*) was an attempt to find what degree of reproducible dimensional accuracy can be obtained when using a sodium-silicate binder for the moulds of a fair-sized batch of production castings.

The casting used in the experiment is shown in Fig. 2. Eighty-four of these castings were made in sand moulds bonded with sodium silicate, and an equal number in green-sand moulds. Dimension A, on castings made in green sand, averaged 7.615 in. When all 84 readings were subjected to statistical analysis, the average variation encountered 95 per cent. of the time was ± 0.028 in., whereas the variation in the case of sodium-silicate sand was only ± 0.014, as is shown in the data in Table 1. It was therefore concluded that a sand-mould bonded with sodium silicate gave greater dimensional accuracy in the castings than an ordinary green-sand mould.

TABLE 1.—*Data obtained in the Dimensional-accuracy Experiment.*

Dimension.	Average variation.	
	Green-sand.	Sodium-silicate sand.
A	0.028	0.014
B	0.028	0.016
C	0.028	0.038
D	0.030	0.026
E	0.028	0.032

Cobalt-60 Radiography*

The traditional method of inspecting castings for internal defects in the authors' foundry was originally cutting, breaking and etching. Shrinkage voids usually constituted the largest part of sub-surface defects in the castings. Cobalt-60 radiography has helped improve the quality of the pearlitic malleable castings in the following way. The cobalt source, which was approximately the size of a pencil eraser, had the equivalent penetrating power of a 2-million volt X-ray machine, the gamma radiation reacting with film in the same way as X-rays. Gamma radiographs were used (*a*) to check new casting designs; (*b*) to design gating layouts, and (*c*) to establish standards for the inspection department.

For example, a small gasoline-engine crankshaft was usually made in pearlitic-malleable iron with two gates and feeders. A small tie-bar was required between the two counterweights, to prevent distortion during annealing. The two gates were combined in the form of an enlarged tie-bar, which could be removed with a milling operation, and experimental castings made in this manner were proved satisfactory very quickly by means of gamma radiographs. This small change resulted in a cost reduction of 2.3 per cent. The use of the cobalt-60 in this way has greatly reduced the time taken in the design development of parts, and has allowed sound casting techniques to be determined with a minimum of casting trials.

* From work done by George C. Warneke (National Malleable & Steel Castings Company, Melrose Park Works, Melrose Park, Illinois).

* From work done by A. J. Karam (central foundry division General Motors Corporation, Saginaw, Michigan).

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Book Reviews

Technologie der Giessereiformstoffe [In German], by Dr. F. Hofmann. Published by Georg Fischer, A.G., Schaffhausen, Switzerland. (120 pp., 20 ill.)

This book on the "Technology of Foundry Moulding Materials" can be described as a companion volume to another publication of the firm: *Sinn und Zweck der Formsandprüfung* (Aim and Purpose of Testing Moulding Sands), by W. Götz (127 pp., 52 ill., 1954). The earlier book deals with the use of various sand-testing equipment manufactured by Georg Fischer A.G. and the conclusions which can be arrived at from test results—in short—it explains "what to test and how to test" in relation to foundry sand.

The present book answers the question "why to test" and the first chapter, after explaining the relationship between average grain-size, degree of uniformity and A F S—grain-fineness number, gives directions for the correct choice of grain-size and grain distribution of moulding sands for given purposes. (There is a printing error in the second table on page 12, in the position of the headings: the multiplying factor and product should be reversed). It also indicates the desirable range of sand permeability for light-metal and copper-base alloy castings, for cast-iron, malleable iron and cast steel. A further chapter deals with fundamental and widely-different properties of conventional sand-binders, such as clay in natural and synthetic sands, organic binders for core-sands (oil, starch, resin), silesters for investment castings, resins for shell moulding and sodium silicate for the CO_2 Process. Finally, the effect of additions to the moulding sand of such materials as coal-dust, pitch and wood-flour, and the protective action of mould blackings are discussed.

O. P. EINERL.

Aluminiumguss in Sand und Kokille, Sixth Edition. (Sand and Die-cast Aluminium Castings) in German, by Dr. Roland Irmann. Published by Aluminium G.m.b.H., 29 Jagerhofstrasse, Düsseldorf, Germany; price DM 42.

This well known and justifiably widely-used book has now been thoroughly revised and brought up to date for its sixth edition. There has also been published a French version, ably translated by M. J. Moiroud. The new edition has maintained the general plan of the previous editions, but some parts have been shortened, partly because the information is available in other German publications, such as the *Aluminium Taschenbuch*, partly because these sections are not of specific interest to the founder—for instance the details of production of ingots from scrap.

The space thus gained has been devoted to a fuller treatment of recent developments in methods of melting and moulding which have been carefully covered and discussed and, where necessary, illustrated by photographs and drawings which are of the high standard of illustrations maintained throughout the book. The reviewer regrets the omission in this edition of the AID top-cast test-bar mould for the sole reason that—though perhaps somewhat antiquated—it is still in general use in this country.

There is still a scarcity of good introductions to light-metal founding suitable for the practical foundryman. No doubt Irmann's book is one of the best in existence.

E. SCHEUER.

House Organs

Saunders' Magazine, Summer, 1959. Issued by Saunders Valve Company, Limited, Cwmbran, Monmouthshire.

This magazine covers the activities of both Saunders and Goulds Foundries, Limited, and in connection with the latter there is an illustration of the indentures entered into by Mr. William Gould in 1874, the founder of the company. There is also a report in the booklet of an exhibition of Frididaire products, held in Gould's foundry, with the commendable idea of strengthening customer relations and showing employees the uses made of the castings produced and assembled by them. No doubt the employees' wives were asked to inspect the exhibits. The magazine is designed to interest both the employees and the firm's customers—a not-too-easy task.

Staveley News. Vol. 8. No. 3. Issued by the Staveley Iron and Chemical Company, Limited, and the Sheepbridge Company, Limited, near Chesterfield.

The main feature of this booklet (which is published belatedly owing to the dispute in the printing industry) is a story of a 1,300-mile tour of steelworks in Great Britain made by 15 young employees of the company. This magazine is meant for the employees, and as such is a good example of its type. It announces *inter alia* the appointment of Mr. G. H. M. Smith as chief chemist at the Devonshire Works.

Sif-Tips, Vol. 25, No. 106. Issued by the Suffolk Iron Foundry (1920), Limited, Stowmarket, Suffolk.

A normal feature of this publication, unlike many others dealing with welding, is that it is prominently devoted to the repair of castings. In addition, in recent years more and more use is being made of Sif-bronze in manufacturing processes. Progress has been continuous, and now 33 different Sif-rods are available. The booklet carries a number of illustrations of the firm's materials being used, and for most of the jobs it is stated what type of filler-rod was adopted .

New Catalogues

Special and Stainless-steel Castings. It is always interesting to study foundry publicity emanating from abroad, and an example recently received is a catalogue from Marlyd, 6, Rue Albert-Lecocq, Le Perreux-sur-Marne, Seine, France, covering precision castings made by the Shaw Process. The front cover of the catalogue is particularly pleasing; the layout carries an interrupted vertical magenta-coloured band towards the left, and an enclosed area, well balanced, indicates the company's lines of manufacture and the weight range. Above a white strip at the base, the lower half of the cover carries a splendid picture of a number of typical castings. The two inside pages are not so well laid-out as some of the pictures are too small, whilst in the choice and use of type there is also room for improvement.

Chemicals. Albright & Wilson (Mfg.), Limited, 1, Knightsbridge Green, London, S.W.1, have published a 26-page catalogue listing about 400 chemicals. The code number of each chemical is given, its formula, its physical form and how it is packaged. The catalogue will certainly make a valued addition to the reference libraries of both purchasing agents and chief chemists.

Arc-welding Equipment. Rockweld, Limited, Commerce Way, Croydon, Surrey, has issued a 20-page well-illustrated catalogue covering Autopak arc-welding equipment. This machine, which is portable, carries innovations in respect to voltage control; it is intended mainly for submerged-arc welding.